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No. 113

ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering and Standardization of Specifications and Methods of Testing"

TELEPHONE—PENnypacker 3545 | R. E. Hess, Editor | CABLE ADDRESS—TESTING

R. J. Painter, Associate Editor

Number 113 | December, 1941

Spring Meeting and Committee Week in Cleveland

Large Number of Committee Meetings to Be Scheduled; Technical Sessions Planned

THE THIRTEENTH Spring Meeting of the Society and 1942 A.S.T.M. Committee Week will be held in Cleveland, Ohio, March 2 to 6, inclusive, with all sessions at the Hotel Cleveland. It is anticipated that committee meetings will extend throughout the five days of the week and in accordance with the practice of previous years the Spring Meeting will be held on Wednesday, March 4.

Local arrangements are being handled by the Cleveland District Committee headed by Arthur J. Tuscany, Managing Partner, Tuscany, Turner and Associates, *Chairman;* Ray T. Bayless, Assistant Secretary and Editor, American Society for Metals, *Secretary;* and Arthur W. Carpenter, Manager of Testing Laboratories, The B. F. Goodrich Co., *Vice-Chairman.*

Technical Program

While the Spring Meetings in recent years have featured formal technical symposiums, two having been held at recent meetings in Washington, Columbus, and Chicago, due to the intensive pressure on all materials engineers and technologists Committee E-6 on Papers and Publications is not planning to have elaborate presentations this year. However, the Cleveland District Committee plans to sponsor discussions on such features of the simplification and rationalization program that will be of direct interest to the Society, and in addition there may be some informal discussion in certain specific fields. Cooperating with the committee on papers in arranging for these discussions is a Cleveland group consisting of Messrs. Tuscany, Bayless, and Carpenter.

Terminal Tower Development, Cleveland, from the West, with High Level Bridge at Left.

Committee Week

The first Spring Group Meetings of A.S.T.M. Committees were held more than 15 years ago and have continued since that time, this series of meetings having come to be known as Committee Week, usually held during the first week in March, at which time many of the standing committees and their subgroups convene, discuss work on specifications, test methods, and research investigations, and prepare final action on recommendations and reports to be submitted at the annual meeting in June. They were instituted primarily to conserve the expense and time of members who were concerned with the work of more than one technical group, and that primary purpose is still in the forefront today. An earnest effort is made after detailed study and tabulation to schedule meetings with a minimum of conflicts, although some are unavoidable.

Contacts are being made with the A.S.T.M. technical committees, and announcements will be made of the committees which are to convene. Each committee member should receive from the secretaries of the respective groups

a schedule of meetings and in February, well in advance of committee week, a master schedule of meetings is sent to committee members.

PERSONNEL OF CLEVELAND DISTRICT COMMITTEE

As previously indicated, local arrangements are being handled by the Cleveland District Committee, one of nine such groups which have been organized in leading industrial centers to foster interest in A.S.T.M. and to promote general Society welfare in the respective areas. The Cleveland Committee has held a number of interesting meetings during recent years, and in numerous other ways has functioned effectively in the interest of the Society. The personnel of the group as now organized is as follows:

Night Scene of Steel Mills on the Cuyahoga River

Arthur J. Tuscany, *Chairman*, Managing Partner, Tuscany, Turner and Associates.

Arthur W. Carpenter, *Vice-Chairman*, Manager of Testing Laboratories, The B. F. Goodrich Co.

Ray T. Bayless, *Secretary*, Assistant Secretary and Editor, American Society for Metals.

R. H. Danforth, Professor of Mechanics and Materials, in Charge of Warner Laboratories of Mechanics, Hydraulics, Aerodynamics and Materials, Case School of Applied Science.

J. H. Herron, President, The James H. Herron Co.

Zay Jeffries, Technical Director, Incandescent Lamp Dept., General Electric Co.

W. W. Rose, Executive Vice-President, Gray Iron Founders' Society, Inc.

E. G. Kimmich, Development Engineer, The Goodyear Tire and Rubber Co.

G. A. Reinhardt, Director of Metallurgy and Research, The Youngstown Sheet and Tube Co.

H. A. Schwartz, Manager of Research, National Malleable and Steel Castings Co.

E. C. Smith, Chief Metallurgist, Republic Steel Corp.

F. G. Steinebach, Editor, *The Foundry*.

R. B. Textor, Sales Manager, The Textor Laboratories.

F. L. Wolf, Technical Director, The Ohio Brass Co.

E. E. Ware, The Sherwin-Williams Co.

A.S.T.M. Student Membership

A TABULATION OF student membership, just completed, shows that 44 leading technical schools, universities, and colleges are represented in the total of 532 student members. The membership in 22 of these institutions represents a very considerable portion of the total. Those with five or more student members include the following: College of the City of New York, Ohio State University, University of Alabama, University of Delaware, Cornell University, Rensselaer Polytechnic Institute, University of Pennsylvania, University of Kansas, Detroit Institute of Technology, Grove City College, Iowa State College, Massachusetts Institute of Technology, Philadelphia Textile School, University of Illinois, Worcester Polytechnic Institute, and University of New Mexico. Particularly notable is the record of the College of the City of New York with 226 members; Ohio State with 69; and University of Delaware with its 42.

In a number of these schools, use is made of various A.S.T.M publications, including the Book of Standards which is furnished to student members at a very considerable saving. A factor which influences to some extent student membership at certain schools is the Student Membership Prize Award Plan under which membership is awarded to students for notable work in certain fields, including testing laboratory, mechanics of materials, chemical engineering, etc. These awards are underwritten by interested members of the Society. A list of schools where the plan is in effect with the donors follows:

Cornell University	F. M. Farmer
Detroit Institute of Technology	F. O. Clements
Grove City College	A. E. Pew, Jr.
Iowa State College	H. P. Bigler
Massachusetts Institute of Technology	Arthur W. Carpenter
Rensselaer Polytechnic Institute	Herbert Spencer
University of Idaho	A. E. Peterson
University of Illinois	S. H. Ingberg
University of Kansas	Walter Bohnstengel
University of Pennsylvania	C. L. Warwick
Worcester Polytechnic Institute	S. Collier

The Society is definitely interested in having a large number of student members because in this way future engineers are acquainted with the value of A.S.T.M. work. In turn, the students receive valuable publications at very nominal charges (the *only* fee is $1.50 yearly dues). For this they receive without charge a selection of any one of the 13 compilations of A.S.T.M. standards (priced for members from 75 cents to $1.50) or they can procure the "Selected A.S.T.M. Standards for Students in Engineering." The ASTM BULLETIN, Index to Standards, and preprints are furnished also.

Any member of the Society who wishes information on the Student Membership Prize Award Plan should write to A.S.T.M. Headquarters.

OPM Industrial Conservation Bureau Has Important Materials Activities

Specifications and Conservation-Substitution Branches of Interest to A.S.T.M.

Widespread interest in the important work of the newly organized Bureau of Industrial Conservation in the Office of Production Management and the appointment of the Society's Secretary-Treasurer, C. L. Warwick, as chief of one of its four branches—the Specifications Branch—has suggested the preparation of an information type article and a recording of some of the more important recent developments in these phases of the defense effort. As has been previously announced, the part-time services of Mr. Warwick were loaned to OPM to aid in the organization of Government conservation and related specification activities which resulted in the formation last May of the Government Conservation Branch in the Division of Purchases, OPM. By action of the Executive Committee in June and October, his services have been continued.

The work of the Government Conservation Branch has been continued and further developed as the Specifications Branch of the new Bureau of Industrial Conservation. In addition to the conservation work with which the Secretary-Treasurer is concerned, coordinated in the program of the new Bureau will be the Conservation Section of OPM and certain units of the former Office of Price Administration and Civilian Supply. The widespread and varied field of conservation, specifications, salvage, and simplification of design will thereby be centered in one unit. Each of these approaches had been directed at the same result—strategic disposition of the most economical and limited supplies now available.

Although considerable progress toward this end already had been achieved by the several groups which have now been merged, the importance of the work made it desirable that it be coordinated through one central organization.

Avoidance and elimination of waste and the unnecessary use of vital raw materials represent an important phase of the effort of SPAB to meet all legitimate military requirements first, while keeping essential civilian economy in such working order that emergency dislocations may be minimized and an ultimate return to normalcy may be made less difficult.

The Bureau of Industrial Conservation is operating along several broad lines, including revision of Government specifications; avoidance of waste in industrial practices; promotion of the use of substitute materials where they are available; stimulation of the collection of salvage; simplification of service and manufactured goods; and the general elimination of all non-essential uses of materials in which shortages exist or may be imminent. In undertaking its program, the Bureau is seeking the cooperation of state and municipal governments, representatives of affected industries, and the general public. It will also call upon the resources and personnel of several governmental agencies such as the National Bureau of Standards, which has offered full support and cooperation. The Bureau will work as frequently as possible through the Commodity Branches of OPM and with defense industry advisory committees.

The Bureau of Industrial Conservation will work closely with the Consumer Division of the Office of Price Administration, headed by Miss Harriet Elliott.

Lessing J. Rosenwald, former Chairman of the Board of Directors, Sears, Roebuck and Co, is Director of the Bureau of Conservation, and Paul Cabot serves as Deputy Director and also as Acting Chief of one of the four branches—salvage. H. A. Anderson, long affiliated with the Western Electric Co. and a former member of the A.S.T.M. Executive Committee and active in many phases of the Society's technical work, particularly in the field of nonferrous metals, is Head of the Conservation and Substitution Branch. The important work of the Simplification Branch is directed by E. W. Ely, Chief of the Division of Simplified Practice, National Bureau of Standards.

Specifications Branch

While the work of the Specifications Branch is ramified, some information of the work can be given under three divisions:

1. One important activity involves close collaboration with the Federal Specifications Executive Committee in the development of Emergency Alternate Federal Specifications which are issued in the interest of conservation of certain strategic materials. A rather complete announcement of this work appeared in the August ASTM Bulletin, page 49, with a list of Federal Emergency Specifications; a second list was published in the October Bulletin, page 43; and the latest one is given in this December issue.

2. A very considerable portion of the Specificatons Branch activities is carried out with the various divisions and bureaus of the War and Navy Departments and the Maritime Commission, as well as other defense agencies, this work being to aid and advise these agencies in the conservation of critical materials by the substitution of less scarce materials. This leads frequently to revisions of Army and Navy specifications. While much of this work concerns noncombat materials, there are numerous important instances where substitutions have been recommended as essential in connection with military items. As an example, the replacement of nickel by molybdenum wherever possible so that the nickel can be conserved for use where absolutely essential is cited. Much of this work is carried out with OPM industrial branches, particularly in the Materials Division.

3. Another very fast growing and important phase of the work involves the conservation of critical materials in defense housing and related construction such as recreation buildings, schools, hospitals, water works, sewerage disposal plants, etc. This work involves the preparation

of lists of critical materials which will be permitted in the construction and for which priorities are granted by OPM. Individual projects must be studied to see that details conform with restrictions embodied in the permissible list. Allied to this work is that involving plumbing materials and practices, advising where and in what amounts critical materials will be permitted. Much of this involves close cooperation with various Government housing agencies.

In handling all of this work Mr. Warwick has the services of able associates, several of whom are loaned by leading industrial organizations. James T. Kemp, Adviser on Non-Ferrous Metals, who was formerly associated with the technical work of the American Brass Co., and Dr. Joseph S. Laird, Chemist, Ford Motor Co., are occupied with many phases of the work covered in Nos. 1 and 2 described above. Henry H. Waples, architectural engineer with the PBA is concerned almost entirely with the conduct of the work on defense housing and related construction. Associated with him are two other experienced engineers, Messrs. H. H. Matthieson and J. L.Cassidy.

Mr. Dean Harvey serves as a consultant on a number of conservation problems with particular reference to materials entering into electrical construction and distribution. Harlan W. Bird, formerly associated with the National Bureau of Standards, is likewise handling numerous phases of work of the specifications branch and also is concerned with problems of office management.

Conservation, Simplification, and Salvage Branches

Likewise of definite interest to A.S.T.M. members is the work of the Conservation-Substitution Branch in which in addition to Mr. Anderson there are several leading technical men who are concerned with A.S.T.M. activities including E. J. Hergenroether, D. L. Conwell, and L. S. Reid, Chairman of Committee D-6 on Paper and Paper Products. Their work deals largely and directly with industrial problems and in many instances there is close collaboration between the conservation and specifications branches. Also this branch is in close contact with the OPM Civilian Supply Division.

A very important part of the work involved in the Bureau of Conservation pertains to simplification of sizes, shapes, and related problems. While the question of standardizing specifications is important, in the field of dimensional standards, simplification is also essential. A notable example of such work is that involving structural steel shapes, a short announcement of which appears in this Bulletin.

The work of the Salvage Bureau is in two broad classes—industrial which involves plant scrap, better classification of scrap metals, and related problems; and general salvage which includes materials used in the household and such categories.

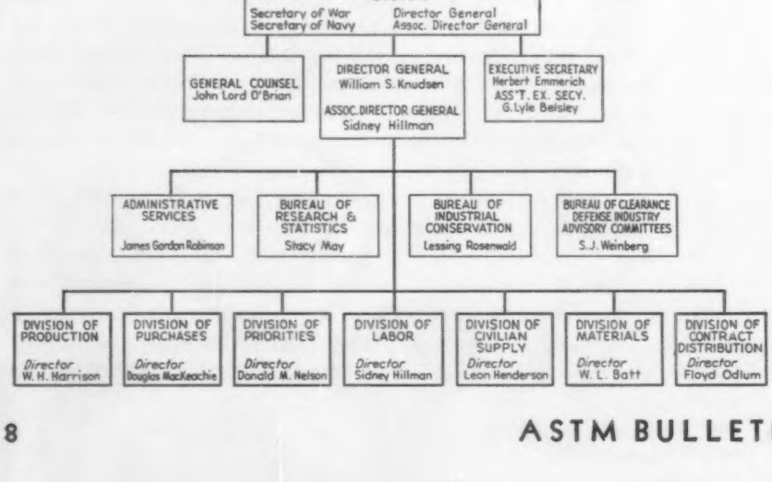
Importance of Emergency Specification Work

From the constantly growing demand for defense materials, it is becoming more essential that the development of emergency specifications, whether it involves standardization or simplification, must extend into the industrial field, for while a great many savings may be effected in Government specifications, the industrial problem is much broader.

An important activity of this kind is the development of a list of National Emergency Steel Specifications, as announced in detail in the October ASTM Bulletin, page 11, with the personnel of certain technical advisory committees given in another article in this December Bulletin. This work is an important result of collaboration by the Bureau of Industrial Conservation with the OPM Iron and Steel Branch and industry, with three organizations acting as sponsors, the A.S.T.M., the S.A.E., and the American Iron and Steel Institute.

The Executive Committee of the Society was cognizant early this year that while ASTM procedure for issuing new specifications and revising standing ones was pretty well streamlined, the National Emergency might demand even more prompt treatment; therefore regulations for approving emergency alternate provisions were set up as detailed on page 321 of the A.S.T.M. 1941 Year Book. The principles of conservation which are basic in the new OPM Bureau of Industrial Conservation are the same which underlie the A.S.T.M. setup.

OFFICE OF PRODUCTION MANAGEMENT



Personnel of Industrial Branches, OPM

Since the information may be of interest and assistance to A.S.T.M. members, there is reproduced here a chart showing the organization of the Office of Production Management. It will be noted that the Bureau of Industrial Conservation concerning the activities of which a detailed article appears in this Bulletin is shown on this chart; also, the seven branches of OPM of which four are of particular concern to members, namely, Production, Purchases, Civilian Supply, and Materials. A revised personnel directory of these industrial branches has been issued as of November and the titles of the various division branches

with the name of the director, deputy director, chief or acting chief follow:

PERSONNEL DIRECTORY
OFFICE OF PRODUCTION MANAGEMENT
INDUSTRIAL BRANCHES

Division Branch	*Director, Deputy Director Chief or Acting Chief*
1. Production Division	
Director	W. H. Harrison
1-A. Aircraft Branch	M. C. Meigs
1-B. Ordnance Branch	E. F. Johnson
1-C. Tools Branch	Mason Britton
1-D. Shipbuilding Branch	Capt. J. O. Gawne
1-E. Construction Branch	W. V. Kahler
2. Purchases Division	
Director	Douglas C. MacKeachie
Deputy Director	Arthur Newhall
2-A. Food Supply Branch	Howard Cunningham
2-B. Textiles, Clothing and Equipage Branch	R. R. Guthrie
2-C. Health Supplies and Fire Equipment Branch	W. E. Bittner
2-D. Containers Branch	Walter Shorter
3. Civilian Supply Division	
Director	Leon Henderson
Deputy Director	Joseph L. Weiner
Supervisor of Industry Branches	Reavis Cox
3-A. Pulp and Paper Branch	V. L. Bassie
3-B. Printing and Publishing Branch	Norbert A. McKenna
3-C. Lumber and Building Materials Branch	John L. Haynes
3-D. Plumbing and Heating Branch	Leighton Peebles
3-E. Electrical Appliances and Consumers Durable Goods Branch	Jesse L. Maury
3-F. Automotive, Transportation and Farm Equipment Branch	A. Stevenson
3-G. Industrial and Office Machinery Branch	Nathaniel Burleigh
3-H. Rubber and Rubber Products Branch	Barton Murray
3-I. State and Local Governments Requirements Branch	Maury Maverick
4. Materials Division	
Director	W. L. Batt
Deputy Director	A. I. Henderson
Deputy Director	Philip D. Reed
4-A. Aluminum and Magnesium Branch	A. H. Bunker
4-B. Chemicals Branch	E. R. Weidlein
4-C. Iron and Steel Branch	A. D. Whiteside
4-D. Power Branch	J. A. Krug
4-E. Cork and Asbestos Branch	F. W. Gardner
4-F. Nickel Branch	Louis Jordan
4-G. Tungsten Branch	H. K. Masters
4-H. Copper-Zinc Branch	D. A. Uebelacker
4-I. Manganese-Chrome Branch	Andrew Leith
4-J. Tin-Lead Branch	Erwin Vogelsang
4-K. Mica-Graphite Branch	H. F. Wierum
4-L. Miscellaneous Minerals Branch	R. J. Lund

Four New Tentative Standards Approved

On the recommendation of four of the Society's standing committees, there have been approved recently four new tentative standards. Action on these was taken by letter ballot of Committee E-10 on Standards after reviewing the letter ballot results submitted by the respective technical committees.

A list of the proposed new standards with the names of the standing committees responsible together with the date of approval by the Society follows:

Tentative Method of Measurement of Mica Stampings Used in Electronic Devices and Incandescent Lamps (D 652 - 41 T); Committee D-9 on Electrical Insulating Materials; October 22, 1941.

Tentative Methods of Chemical Analysis for Aluminum, Columbium, and Lead in Steel (E 30 - 41 T); Committee E-3 on Chemical Analysis of Metals; October 22, 1941.

Tentative Definitions of Terms Relating to Lime (C 51 - 41 T); Committee C-7 on Lime; October 23, 1941.

Tentative Method of Test for Compressive Strength of Natural Building Stone (C 170-41 T); Committee C-18 on Natural Building Stones; October 23, 1941.

Measurement of Mica Stampings Used in Electronic Devices and Incandescent Lamps.—This new A.S.T.M. method provides standard procedures for the measurement of hole spacing, thickness, and hole size in small pieces of fabricated natural mica such as bridges, spacers, and supports in electronic devices and incandescent lamps. In each case the apparatus is prescribed, the type of specimen is covered, and detailed procedures given for the measurements to be made. Accompanying the method is a diagram giving construction details of the apparatus for determining the hole size. Subcommittee IX on Mica Products headed by M. P. Davis developed this method and referred it to Committee D-9.

Methods of Chemical Analysis for Aluminum, Columbium, and Lead in Steel.—The Methods of Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron (E 30 - 39) are among the most important standards in the charge of A.S.T.M. Committee E-3 on Chemical Analysis of Metals and the procedures given are very widely used in the control of steel composition. The methods, last revised in 1939, cover the determination of some 14 elements. The committee is continuing its work on the preparation of methods for the determination of all the elements that the ferrous analyst may encounter and has now completed methods of analysis for three more elements, namely, aluminum, lead, and columbium.

Small amounts of aluminum (usually less than 0.05 per cent) may be present in steel from the raw materials employed or through the addition of aluminum as a deoxidizing agent or means of controlling grain size. Columbium is added to stainless and heat-resistant steels to make them softer and more ductile and to overcome intergranular corrosion. The addition of approximately 0.2 to 0.25 per cent of lead greatly improves machinability of steel and much screw stock is now leaded steel.

Definitions of Terms Relating to Lime.—These definitions cover such terms as liming material, chemical lime, available lime, etc., and also include a definition of the term lime which is "the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime used for any purpose." This tentative standard which is in effect a revision of and will be added when adopted to the Standard Definitions of Terms Relating to Lime, C 51 - 39, is under the immediate jurisdiction of Committee C-7's Subcommittee VIII on Nomenclature and Definitions, headed by W. V. Brumbaugh.

Test for Compressive Strength of Natural Building Stone.—This method covers the sampling, preparation of speci-

mens, and procedure for determining the compressive strength of natural building stone. Requirements cover the apparatus to be used, the shape and method of obtaining specimens and related factors. Also prescribed is conditioning which indicates that if it is to be tested in the dry condition, specimens should be dried at 105 ± 2 C. for 24 hr., and if in the wet condition they must be immersed in water at 20 ± 5 C. for 48 hr. and tested immediately after removal from the water bath. This new test was developed by Committee C-18's Subcommittee III on Test Procedures whose chairman is D. W. Kessler. This is the first of a number of recommendations expected to come from Committee C-18 which was reorganized about a year and a half ago.

With the exception of the revisions in the Methods of Chemical Analysis for Aluminum, Columbium, and Lead in Steel (E 30 – 41 T), the new tentative standards described above appear in the 1941 Supplements to Parts II and III of the 1939 Book of Standards. They can be purchased in separate pamphlet form at 25 cents a copy. The revisions in E 30 are to be published in the form of a separate reprint supplementing the Volume on Methods of Chemical Analysis of Metals. A copy will be sent to any A.S.T.M. member by Headquarters upon receiving his request; purchasers of the volume are also entitled to a copy upon request. Extra copies are available at 25 cents each.

1941 Supplements to Book of A.S.T.M. Standards Completed; Index to Standards Issued

Printing and binding work on the respective 1941 Supplements to each Part of the Book of A.S.T.M. Standards has been completed and the volumes are now being distributed. The books are of course furnished to members according to the Parts of the Book of Standards they receive and to all purchasers. Each purchaser of the Book was furnished early in October with a description of the new Supplements, together with an order blank.

These volumes apply to Part I on Metals; Part II on Nonmetallic Materials—Construction; and Part III on Nonmetallic Materials—General. With the issuance of the 1941 Supplements, the cycle of publication of the 1939 Book of Standards is complete. This three-year period is the first in which the Book was issued in three Parts and in general the practice has worked satisfactorily. Just how soon a further division of the Book may be necessary depends upon the growth of the Society's standardization work. Considering the present number of standards and volume of pages involved it would seem that when the 1942 Book of Standards is issued (1942 is the year when another complete Book of Standards will be published—with Supplements in 1943 and 1944), each of the three Parts will be about as large as can be handled conveniently, each probably aggregating 1300 to 1500 pages.

While statistics on the number of pages in the current Books of Standards are significant only to give an idea of the size of the books, since there are many cases where standards are published in the Book of Standards and again in the 1940 Supplement, and in some cases also in the 1941 Supplement, they are recorded here as information of general interest.

Pages in Books of Standards

	Part I	Part II	Part III
1939 Book	1344	1253	1201
1940 Supplement	501	371	597
1941 Supplement	619	449	663

Index to Standards

The Supplements are designed so that users can refer readily to any particular standard or tentative standard they wish to find, but instead of incorporating a detailed subject index, the Society is again publishing its Index to A.S.T.M. Standards simultaneously with the Supplements and each member and all others who receive the Supplements will shortly get a copy of the Index in a separate mailing. Members should note that the Index, now almost an indispensable part of the Book of Standards, provides up-to-date references to the Parts of the Book of Standards or Supplements where each of the 1043 specifications and tests appears in its latest form.

The Index gives titles and serial designations of the standards under appropriate subject headings and there is also published as a separate feature a complete list of all A.S.T.M. serial designations in numeric order with the page references to publications where they appear. This Index should be used more and more widely by the members and those who are concerned with A.S.T.M. specifications and tests since it is designed to facilitate reference to the standards.

Members Can Give Index to Purchasing Agents

Some time ago contacts were made through the courtesy of the National Association of Purchasing Agents with leading purchasing executives, the Society offering to furnish an Index each year to those men who found it of service. As a result, a large number of purchasing agents receive the Index annually and each year many new names are added to the permanent list. It is suggested that members of A.S.T.M. check with the purchasing agents of their company to determine whether the Index would be of service and if they are not receiving it, a note to A.S.T.M. Headquarters will insure that the purchasing agent's name is added to the list.

Technical Advisory Committees Formed for National Emergency Steel Specifications Work

In the work involving the development of a List of National Emergency Steel Specifications, which project was described in detail in the October ASTM Bulletin, considerable progress has been made and the personnel of four technical advisory committees has been approved. This work which was launched by the Office of Production Management is being carried out by the A.S.T.M., the Society of Automotive Engineers, and the American Iron and Steel Institute with the close cooperation of the War and Navy Departments. The objective is to establish a selected list of steel specifications to be designated a List of National Emergency Steel Specifications which will involve a selection from existing standards of a minimum number of specifications, compositions, and sections necessary to meet the requirements of the national defense, both direct and indirect.

C. L. Warwick, Administrator of the project, and the Administrative Committee have been working intensively on the development of technical advisory committees which are required to do the actual work and it will be noted from the personnel lists at the end of this article that the men serving come from both producing and consuming fields. Each committee will take full advantage of the standardization which has been done and will keep constantly in mind the scarcity of critical metals and alloying elements.

With respect to the selection of personnel, those responsible are appointing men who have broad experience and who should be in a position to render efficient service. The committees are being organized, keeping in mind the numerous interests which may be concerned with the various phases of the work, but basically each individual is on the committee because of his own personal technical qualifications.

In addition to the groups listed covering carbon steel plates, alloy steel plates, aeronautical steels, and structural steel shapes, the selection of personnel in the following steel fields is practically complete: rails and track accessories; wrought steel wheels; carbon and alloy steel bars, blooms, billets and slabs; concrete reinforcement steel; and axles—rolled or forged.

It is perhaps pertinent to record one other point being definitely kept in mind by the Administrative Committee, namely, that prior to the call of meetings—all of which will be in Washington—the chairman and those in charge of the technical advisory committees will have circulated the Government service branches, large users of materials, and the producing interests to obtain from them their respective opinions concerning the minimum number of specifications and steels deemed essential. This material will be correlated with other information and facts and made available to the members of the technical advisory committees for examination and study in advance of the meetings.

OPM PROJECT—NATIONAL EMERGENCY STEEL SPECIFICATIONS

Technical Advisory Committee on Carbon Steel Plates

Chairman: Oscar U. Cook, Asst. Mgr., Dept. of Metallurgy, Inspection & Research, Tennessee Coal, Iron & Railroad Co.

Secretary: J. O. Leech, Asst. Mgr., Metallurgical Div., Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, Pa.

Government:

Representing the *War Department*
Major G. L. Cox; Watertown Arsenal, Watertown, Mass.
Alternate: E. L. Holladay; Specifications Section, Office Chief of Ordnance, Room 1362, Social Security Bldg., Washington, D. C.

Representing the *Navy Department*
George A. Pleam; Materials Engineer, Bureau of Ships, Room 0233, Navy Bldg., Washington, D. C.

Representing the *Bureau of Marine Inspection and Navigation*
James W. Wilson; Senior Marine Engineer, Room 1834, Commerce Bldg., Washington, D. C.

Representing the *Federal Specifications Executive Committee*
Lt. Comdr. G. A. Hunt; Bureau of Yards & Docks, Room 4423, Navy Bldg., Washington, D. C.

Industrial Consumers and General Interests:

David Arnott; Chief Surveyor, American Bureau of Shipping, 47 Beaver St., New York, N. Y.
E. J. Edwards; Chief Metallurgical Engineer, American Locomotive Co., N. Jay St., Schenectady, N. Y.
F. H. Frankland; Dir. Eng., American Institute of Steel Construction, Inc., 101 Park Ave., New York, N. Y.
L. B. Jones; Engineer of Tests, Pennsylvania Railroad Co., Altoona, Pa.
D. B. Rossheim; Chief Engineer, Fabricated Products Div., M. W. Kellogg Co., 225 Broadway, New York, N. Y.
V. R. Willoughby; Vice-President in Charge of Engineering, American Car & Foundry Co., 30 Church St., New York, N. Y.

Producers:

Oscar U. Cook; Asst. Mgr., Dept. of Metallurgy, Inspection & Research, Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
E. H. Davidson; Metallurgical Engineer, Structural Plate & Stainless Steel Bureaus, Carnegie-Illinois Steel Corp., 1208 Carnegie Bldg., Pittsburgh, Pa.
E. F. Kenney; Metallurgical Engineer, Bethlehem Steel Co., Bethlehem, Pa.
R. W. Lilley; Engineer of Tests, Worth Steel Co., Claymont, Del.
L. P. McAllister; Metallurgical Engineer, Lukens Steel Co., Coatesville, Pa.
H. C. Smith; Asst. Chief Metallurgist, Great Lakes Steel Corp., Tecumseh Rd., Ecorse, Detroit, Mich.

Consulting Member:

J. W. Morrow, Steel Co. of Canada, Ltd., Hamilton, Ont., Canada

Technical Advisory Committee on Alloy Steel Plates*

Chairman: E. F. Kenney, Metallurgical Engineer, Bethlehem Steel Co.

Government:

Representing the *War Department*
Major G. L. Cox; Watertown Arsenal, Watertown, Mass.
Alternate: E. L. Holladay; Specifications Section, Office Chief of Ordnance, Room 1362, Social Security Bldg., Washington, D. C.

Representing the *Navy Department*
George A. Pleam; Materials Engineer, Bureau of Ships, Room 0233, Navy Bldg., Washington, D. C.

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Eric Dudley; Materials & Standards Engineer, Curtiss Aeronautical Div., Curtiss Wright Corp., Buffalo, N. Y.
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Alternate: Paul W. Boone; Glenn L. Martin Co., Baltimore, Md.
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John Mitchell; Metallurgical Engineer, Alloy Div., Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, Pa.
M. J. R. Morris; Chief Metallurgist, Republic Steel Corp., Massillon, Ohio
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Henry Wysor; Metallurgical Engineer, Bethlehem Steel Co., Bethlehem, Pa.

Tubes

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H. R. Lewis; Chief Metallurgist, Ohio Seamless Tube Co., Shelby, Ohio
A. J. Williamson; Chief Metallurgist, Summerill Tubing Co., Bridgeport, Pa.
E. C. Wright; Chief Metallurgist, National Tube Co., Frick Annex, Pittsburgh, Pa.

Stainless—Flat and Bars

L. S. Bergen; Associate Director of Metallurgy & Research, Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.
E. H. Davidson; Metallurgical Engineer, Structural Plate & Stainless Steel Bureaus, Carnegie-Illinois Steel Corp., 1208 Carnegie Bldg., Pittsburgh, Pa.
B. H. DeLong; Chief Metallurgist, Carpenter Steel Co., 101 W. Bern St., Reading, Pa.
H. A. Grove; Mill Metallurgist on Alloy Flat Products, Republic Steel Corp., Massillon, Ohio
R. A. Lincoln; Metallurgical Engineer, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

Consulting Members:

J. W. Morrow, Steel Co. of Canada, Ltd., Hamilton, Ont., Canada
F. H. Saniter, British Purchasing Commission, 908 McGill Bldg., 9th & G Sts., N. W., Washington, D. C.
Alternate: H. L. Chamberlain, 1523 Market Ave., North, Canton, Ohio

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W. H. McCune; Asst. Engineer, Standards & Tests Section, Bureau of Ships, Room 2346, Navy Bldg., Washington, D. C.
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Raymond Archibald; Senior Structural Engineer, Div. of Tests, Public Roads Administration, Washington, D. C.

Industrial Consumers and General Interests:

David Arnott; Chief Surveyor, American Bureau of Shipping, 47 Beaver St., New York, N. Y.
J. E. Bernhardt; Bridge Engineer, Chicago & Eastern Illinois Railway, 6600 So. Union Ave., Chicago, Ill.
M. C. Blest; Engineering Asst. to President, Pressed Steel Car Co., Inc., 2500 Koppers Bldg., Pittsburgh, Pa.
H. C. Boardman; Research Engineer, Chicago Bridge & Iron Co., 1305 W. 105th St., Chicago, Ill.
F. H. Frankland; Director of Engineering, American Institute of Steel Construction, Inc., 101 Park Ave., New York, N. Y.
C. F. Goodrich; Chief Engineer, American Bridge Co., Frick Bldg., Pittsburgh, Pa.
LaMotte Grover; Structural Welding Engineer, Air Reduction Sales Co., 60 E. 42 St., New York, N. Y.
Jonathan Jones; Chief Engineer, Fabricated Steel Construction, Bethlehem Steel Co., Inc., Bethlehem, Pa.
A. R. Wilson; Engineer of Bridges & Buildings, Pennsylvania Railroad Co., 665 Broad St. Station, Philadelphia, Pa.

Producers:

E. H. Davidson; Metallurgical Engineer, Structural Plate & Stainless Steel Bureaus, Carnegie-Illinois Steel Corp., 1208 Carnegie Bldg., Pittsburgh, Pa.
E. F. Kenney; Metallurgical Engineer, Bethlehem Steel Co., Bethlehem, Pa.
S. M. Newbrander; Metallurgist, Weirton Steel Co., Weirton, W. Va.
J. J. Shuman; Inspecting Engineer, Jones & Laughlin Steel Corp., 3rd Ave. & Ross St., Pittsburgh, Pa.
W. Warner; Dept. of Inspection & Metallurgy, Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.

Consulting Member:

J. W. Morrow, Steel Co. of Canada, Ltd., Hamilton, Ont., Canada

The Examination of Used Engine Crankcase Oil

By L. L. Davis[1]

THE determination of the optimum life in service of a crankcase oil and at the same time the insurance of safe, long operating life for the engine require a study of the engine, the oil, and the operating conditions as a closely interrelated unit. In the final analysis, the condition of the engine is the determining factor. Analysis of the used oil provides informative data on a specific oil in a given engine under reasonably constant operating conditions. Such data, however, do not necessarily hold for other oils or for other engines and service conditions.

The depreciation of an oil in service results from contamination from two major sources:

1. From sources external to the lubricating system. These extrinsic contaminants (such as those from the combustion zone) depend upon the mechanical conditions of the engine and are not a consequence of the kind or quality of the lubricant.

2. From sources inherent to the lubricating system and to the oil. These intrinsic contaminants result from the changes in the oil and therefore depend upon the quality of the oil as well as upon the operating conditions.

Many laboratory methods have been developed to study the changes that take place in an oil in service. Since the changes are complex and not well understood, the analytical methods are largely proximate rather than exact. Considerable manipulative skill is required to obtain reproducible results; and for an interpretation of the results, an even greater knowledge of the relation of engine and operating conditions to oil changes is required.

The various methods most commonly used for the estimation of the changes that have occurred in a used oil are:

1. Dilution by the fuel.	7. Metal content.
2. Water content.	8. Naphtha insolubles.
3. Viscosity.	9. Chloroform insolubles.
4. Carbon residue.	10. Chloroform solubles.
5. Neutralization number.	11. Oil insolubles.
6. Ash.	12. Resin content.

Interpretation of Analytical Data:

Due to the infinite number of possible combinations of oils, engines, and operating conditions, the interpretation of the results of used oil analysis depends upon a knowledge of the oil used, the type or make of engine, the service conditions, and the *condition of the engine after use*. Such interpretation includes an evaluation of the quantity and character of the various contaminants in the used oil.

Extrinsic Contaminants:

Liquid contaminants from external sources include water or other coolant and unburned fuel. The presence of either a trace of water or water sludge or an appreciable amount, say 5 per cent, of fuel diluents indicates defective mechanical or operating conditions. The crankcase should be immediately drained and the mechanical or operating defect corrected.

Solid contaminants from sources outside the true lubrication system may include dust or dirt from the air or the gasoline and oil containers, lead and soot from the combustion zone, carbon from the thermal decomposition of oil or fuel, and metals or metallic compounds from wear or corrosion of the engine parts.

Chloroform Insolubles:

The *chloroform insolubles* include all of the solid extrinsic contaminants and may, under certain conditions, include some intrinsic contaminants resulting from oxidation of the oil. The chloroform insolubles determined by filtration of a chloroform solution of the used oil are therefore an approximate measure of the solid contaminants, but they do not indicate the nature or source of these contaminants. If the chloroform insolubles are appreciable—say, 0.3 per cent or more—further examination must be made to determine their character. If the ash is relatively low compared to the insolubles, the contaminants are largely soot and carbon which may not be particularly harmful. If the ash shows measurable "silica," failure of the air and oil filters is indicated, and the oil should be discarded immediately and the filters put in condition. A chemical analysis may show the insolubles to be largely lead, but a relatively large amount—possibly 1 per cent—may be tolerated without harm. High insolubles definitely show the oil to have a peptizing action and therefore the engine may be clean. On the other hand, the oil may show a very low insoluble content because of failure to peptize the contaminants and the engine may be extremely dirty.

Intrinsic Contaminants:

The oxidation and decomposition products of the oil may be measured quantitatively by determination of the asphaltenes and resins. Where extrinsic contaminants do not interfere, the relative degree of oxidation may be approximated by means of the carbon residue and viscosity. As the author and coworkers have shown[2] there is a reasonably uniform relationship between the extent of oxidation and these various factors.

Asphaltenes:

The *asphaltenes* or "asphaltic resins," by definition, are the difference between the naphtha insolubles and chloroform insolubles determined by filtration of the used oil in solution in the respective solvents. The asphaltenes are a measure of those oxidation products that are approaching oil insolubility, that is, those products which if oxidized to any further extent will be precipitated as sludge or may "bake out" on hot surfaces and appear as lacquer or varnish.

Chloroform Solubles:

The portion of the asphaltenes which does not bake or polymerize during the drying of the naphtha insolubles

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

[1] Supervisor, Process Division, Continental Oil Co., Ponca City, Okla.

[2] L. L. Davis, Bert H. Lincoln, G. D. Byrkit, and W. A. Jones, "Oxidation of Petroleum Lubricants," *Industrial and Engineering Chemistry*, Vol. 33, p. 339 (1941).

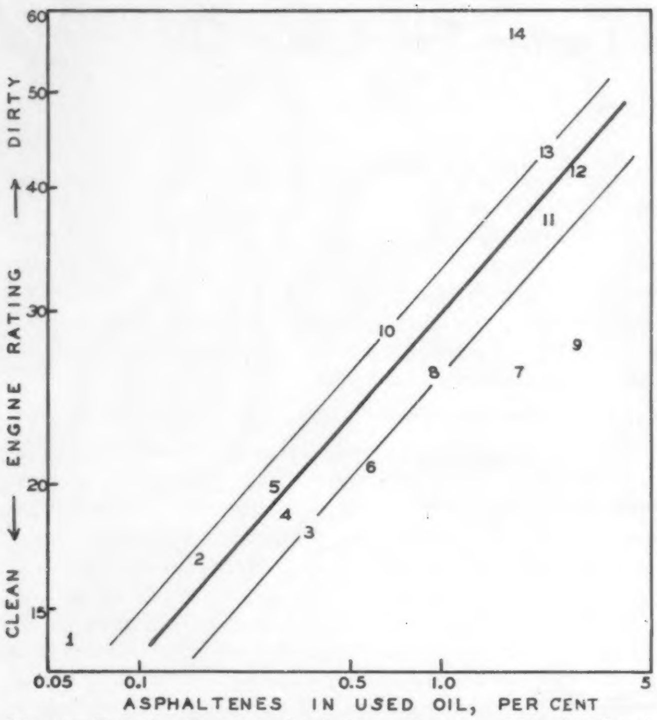


Fig. 1.—Relation Between Asphaltene Content of Used Oil and Engine Cleanliness.

and remains soluble in chloroform has been designated by some laboratories as "*chloroform solubles.*" Several laboratories, particularly the General Motors Research Laboratories, have reported excellent correlation between these "chloroform solubles" of the naphtha insolubles and the amount of varnish on the pistons except in the case of some oils containing detergent compounds. In these cases a large amount of "chloroform solubles" may be present and the engine parts may be free from varnish and adhering sludge.

The tolerance of a given oil to "asphaltenes" or "chloroform solubles" depends upon its "detergent" or peptizing ability. An oil containing a detergent may carry a large amount (possibly 1 per cent or more) of asphaltenes without showing engine dirt or varnish on pistons, but an oil having poor peptizing value and a relatively low asphaltene content may give a very dirty, varnished engine. In the latter case, the asphaltenes are precipitated as rapidly as formed. Therefore the permissible limits of "asphaltene" or "chloroform soluble" content for any given oil must be determined by actual engine inspection.

The relation between asphaltene content of the used oil and engine cleanliness is given in Fig. 1 for fourteen commercial oils used in a Chevrolet engine for a period equivalent to 5000 miles. The engine rating is an average of the ratings given to sixteen points, each being rated on an arbitrary scale in which "0" is perfectly clean and "100" so dirty that failure would result. The probable variation in rating is ± 10 per cent which is indicated by the light lines on either side of the average (heavy) line. Only three oils show appreciable divergence and therefore require further discussion. Oil No. 14 was a solvent-treated Eastern oil having practically no peptizing value, as was indicated by the very low chloroform insolubles of only 0.07 per cent. The insolubles were precipitated as fast as formed, thus giving a relatively dirty engine. The opposite characteristic was found in oil No. 9, which although heavily oxidized carried the insolubles in suspension, having 2.27 per cent chloroform insolubles, and therefore gave a relatively clean engine. Oil No. 7 contained a detergent and an antioxidant and therefore gave a relatively clean engine in spite of the high asphaltene content.

It therefore appears that if the detergent value of an oil could be appreciably increased, a very clean engine might result although the oil contained a high percentage of asphaltenes. It is obvious, however, that the most desirable conditions are a very clean engine and a low asphaltene content in the oil.

Carbon Residue:

Carbon residue is the "carbon" left after the thermal decomposition of the nonvolatile constituents of the oil. Modern refining methods result in very low carbon residues for the new oil. The carbon residue is very sensitive to oxidation products[2] and will increase materially before insolubles are formed. The test therefore is of value as an indication of the progress of oil deterioration before objectionable results occur. The test is of little value in itself; but when data from it are studied in relation to the data from other oil tests and to engine conditions, it adds valuable information to the whole.

Viscosity:

Viscosity, like carbon residue, in the absence of appreciable extrinsic contaminants, indicates the extent of oil oxidation. The resinous oxidation products greatly increase viscosity. Therefore, viscosity measurement becomes a quick, easy, and reasonably accurate method for following trend or rate of oxidation. Since fuel dilution *decreases* viscosity, this factor must be considered when evaluating the change in viscosity during use. If the dilution is more than 3 or 4 per cent, the determined viscosity of the used oil should be factored or the diluent should be removed before determining the viscosity.

However, both viscosity and carbon residue are greatly affected by insolubles; thus in the case of oils containing detergents a high viscosity or carbon residue may be due to suspended insolubles rather than soluble oxidation products. In such case the extent of oxidation of the oil may be estimated by determining either the viscosity or carbon residue of the insoluble free oil. (After filtering off the naphtha insolubles, the naphtha is evaporated from the oil, which is then tested.)

Resin:

To develop a quantitative correlation between viscosity or carbon residue and the amount of oxidation product present in a used oil, the so-called resins (the oxygen-containing hydrocarbons and polymers) may be extracted from the naphtha solution of insoluble free oil. The removal of such resins leaves the oil in practically its original condition.

Neutralization Number:

Neutralization number, even by name, is misleading since it is not a measure only of total acids present. The neutralization number is the total "caustic consumption" of a used oil measured under arbitrary conditions. Other test conditions may give entirely different results. The compounds present in a used oil which consume caustic

are organic acids, phenolic compounds, lactones, resins, and many inhibitor and detergent addition agents. Since the products of oxidation of oil are caustic-consuming in character, the neutralization number is a rough measure of the degree of oxidation, except in the case of oils containing addition agents which mask or otherwise affect the result of the neutralization number test. In a given lubricating system, although the rate of increase in neutralization number may be an index of the rate of oxidation, it does not necessarily represent objectionable oxidation. Thus, one oil may oxidize to a very high neutralization number without producing corrosive acids, whereas another oil may produce corrosive acids even though the neutralization number remains low.

Corrosion:

Corrosion.—The protection of metal surfaces, specifically bearings and cylinder walls, is one of the primary objectives of lubrication. Unfortunately, up to the present time there is no satisfactory or accepted method of determining the probability of corrosion from a used oil. The so-called laboratory "beaker" corrosion tests, including the conventional copper strip tests, have proved to be unreliable as a means of predicting the corrosive tendencies of new or used oils. These tests depend upon the formation of a surface film to indicate "corrosion" whereas surface films are frequently highly protective.

There are two sources of corrosive acids, namely, from the combustion zone and from the oxidation of the oil. The most corrosive acids resulting from oil oxidation are volatile; therefore, as a rule little or none of the more corrosive acids will remain in the used oil. The products of corrosion, however, will be present, and analysis of the metal content of the used oil may indicate the relative corrosiveness of the oil. Fortunately, the metals used in manufacturing detergents for engine oils are sodium, calcium, barium, tin, and aluminum, which are not the metals to be expected as corrosion products from the engine. The metals to be expected from engine corrosion are iron, lead, copper, cadmium, and silver.

The sources of the iron content of a used oil, assuming no external source of finely divided iron or rust, are erosion and corrosion of the engine parts, particularly of the cylinder walls and rings. Although the erosion may be high during the break-in period of a new engine, this source becomes negligible in a properly lubricated and "broken-in" engine. Under the latter conditions, the iron content of the used oil is generally accepted as a measure of the relative rate of wear or corrosion. The results of many road and laboratory engine tests have indicated that those oils which, under severe conditions, will cause bearing corrosion, will also show a relatively high iron content in the used oil.

Lead compounds may be present in large amounts in used oils taken from engines in which "leaded" fuel has been used and obviously this lead is not indicative of corrosion. The lead as it enters the crankcase is largely inorganic in form and therefore inert as far as the oil system is concerned. Many studies have indicated that relatively large quantities of inorganic lead are not harmful. When, however, an oil oxidizes to form corrosive acids, they may react with the inorganic lead to form oil-soluble lead salts of organic acids. Oil-soluble lead salts may also be formed by the corrosion of lead-containing alloys such as copper-lead bearings, by acids formed by the oxidation of some oils. Therefore, although the total lead content of a used oil has little or no significance, the amount of lead soluble in oil may be somewhat indicative of the relative corrosiveness of different oils used in the same equipment under the same conditions of operation.

As an example, Table I shows data from a selected group of crankcase oils used in a Chevrolet test engine, containing copper-lead bearings, operated under the S.A.E. Lubricants Division 67-hr. test conditions and using a fuel containing lead tetraethyl.

TABLE I.—CRANKCASE OIL DATA.

Oil	Corrosion, g. Lost per Insert	Neutralization Number	Oil Soluble Lead, per cent[a]	Total Iron Content, per cent[a]
No. 1	0.12	5.0	0.09	0.027
No. 2	0.35	3.4	0.07	0.075
No. 3	0.48	2.3	0.45	0.062
No. 4	0.76	4.0	0.38	0.044
No. 5	0.98	7.0	0.64	0.130
No. 6	1.35	6.6	0.50	0.153
No. 7	2.47	6.5	0.79	0.153

[a] Metal content reported as the sulfate in percentage of used oil.

These data show that there is no relation between the copper-lead bearing corrosion and neutralization number. There is, however, a reasonably good relation between bearing corrosion and the oil-soluble lead and the total iron contents of the used oils. The relationship is not absolute, as examples have been reported where no corrosion had occurred when appreciable oil-soluble lead was present. This may have been due to the presence of lead compounds of the metallo-organic type (such as lead tetraethyl) which are reported to be inhibitors rather than accelerators. In the author's experience, oils which under sufficiently severe conditions will corrode alloy bearings have shown a relatively high soluble lead content in the used oil. This has been found to be the case, even when no corrodible lead-alloy bearings were in the system, if a leaded fuel had been used. An example of the latter condition is given in Table II and will be discussed below. In the final analysis, however, engine inspection is the only certain method to determine the relative ability of an oil to protect the engine from corrosion.

Interrelation of Operating Conditions and Used Oil Characteristics

As mentioned above, the interpretation of the used oil characteristics depends largely on the engine conditions. Actually, the used oil should be considered merely as a part of the engine. As an example, Table II presents the data from the analysis of four crankcase drainings after 2500 miles of service under severe summer driving conditions. The passenger cars were of a popular make and were not equipped with oil filters. The trucks were of a heavy-duty type equipped with an excellent type of oil filter. The two well-known brands of oil used were of the S.A.E. 30 grade.

The engine ratings were determined in the same manner as those discussed in connection with Fig. 1. Both oils were of the solvent-treated high-viscosity-index type containing addition agents so that all over-all engine ratings were relatively good. The passenger car engines were equipped with noncorrosive lead-babbit bearings. The truck engines were equipped with copper-lead bearings

which showed corrosion with oil No. 2. The truck showed heavy lacquering on the hydraulic valve lifters for oil No. 2, all but three out of twelve being stuck. The truck with oil No. 1 showed no lacquer and only one lifter was slightly stuck.

Referring to the analysis of the used oils, it will be seen that the passenger cars (without filters) show a very much greater oil deterioration than do the trucks (with filters). This shows quite conclusively the role a filter may play in continuously removing insoluble contaminants from the system and thus retarding oil oxidation by the removal of accelerators. Incidentally, this same characteristic was shown in other passenger cars equipped with filters.

TABLE II.—ANALYSIS OF FOUR CRANKCASE DRAININGS AFTER 2500 MILES OF SERVICE UNDER SEVERE SUMMER DRIVING CONDITIONS.

	Passenger Cars		Trucks	
	Oil No. 1	Oil No. 2	Oil No. 1	Oil No. 2
Engine rating	14	19	7	15
Bearing corrosion	None	None	None	*Yes*
Neutralization number	3.1	8.7	0.26	3.4
Naphtha insoluble, per cent	1.56	2.13	0.10	0.22
$CHCl_3$ insoluble, per cent	1.14	0.53	0.05	0.12
Asphaltenes, per cent by difference	0.42	1.60	0.05	0.10
Viscosity at 210 F.				
New oil	60.4	67.9	60.4	67.9
Used oil	67.9	110.6	56.2	70.6
Dilution, per cent	1.8	1.8	2.9	2.8
Water	0	0	0	0
Carbon residue, per cent	2.47	3.25	0.076	2.42
Carbon residue, filtered, per cent	1.45	2.05	0.061	2.30
Resin, per cent	5.85	14.25	0.9	10.50
Iron, per cent				
Total	0.014	0.031	0.002	0.006
Soluble	0.010	0.021	0.002	0.005
Lead, per cent				
Total	0.89	0.92	0.01	0.65
Soluble	0.06	0.78	Nil.	0.42
True color	482	429	30	441

In the case of the trucks, oil No. 1 appears to be safe in all characteristics for continued use. Oil No. 2, although having very low insolubles due to the filter, discloses by the neutralization number, carbon residue, and resin content that considerable oxidation of the oil has taken place.

Both oils show greater depreciation in the passenger cars than in the trucks. Oil No. 1 contains high chloroform insolubles but relatively low asphaltenes, indicating that the contaminants are largely extrinsic. The low viscosity, carbon residue, and resin content all confirm the conclusion that this oil has not been severely oxidized. On the other hand, the high asphaltenes, viscosity, carbon residue, and resins found in oil No. 2 indicate that this oil has been severely oxidized in service.

As found in the trucks, oil No. 2 is corrosive to copper-lead bearings while oil No. 1 is not. It is interesting to note the metal content of the used oils in relation to these facts. In the case of the trucks oil No. 2 contained three times the amount of iron that was found in No. 1, and contained 0.42 per cent of soluble lead as compared to "nil" in oil No. 1. In the case of the passenger cars both oils contained about the same amount of total lead, the only source being the fuel. Oil No. 2, however, contained 0.78 per cent of soluble lead, indicating that this oil had produced the corrosive type of acid which had dissolved 85 per cent of the lead compounds present. Oil No. 1 contained only 0.06 per cent of soluble lead.

Conclusion

From the above discussion, it is evident that an engineer engaged in research may obtain considerable reliable information from a study of the detailed analysis of the used oil in relation to engine conditions. This relationship is too complex to be used for control of routine operation by either the individual or the fleet owner. The correct period between drains must be determined by practical experience with representative oils, in specific equipment, and under given operating conditions. It must primarily be based upon engine conditions, although detailed oil analysis will assist in developing optimum drainage periods. To insure protection of equipment, such drainage periods should be substantially shorter than the indicated maximum useful life of the oil.

In general the recommendations of the equipment manufacturer or the oil company are on the conservative side in order to protect the consumer from troubles which might arise under severe conditions. Certainly, if equipment must be kept in condition for maximum performance under severe conditions, a conservatively short crankcase drainage period is to be recommended.

After the correct drainage period has been determined from experience in service, a drainage schedule in hours or miles of operation should be established and rigidly enforced.

METHODS OF TEST

The scope of this discussion does not include detailed procedures for the laboratory test methods listed below. Standard A.S.T.M. methods are referred to if available. Those interested may obtain the desired procedures from Part III of the 1939 Book of A.S.T.M. Standards and the 1940 and 1941 Supplements thereto, or the 1941 issue of A.S.T.M. Standards on Petroleum Products and Lubricants or from the appropriate subcommittee of the A.S.T.M. Committee D-2 on Petroleum Products and Lubricants.

Sampling:

Final drain samples should be drawn from the hot oil sump immediately after the engine is stopped. Intermediate samples should be drawn from the sump while the oil is hot and the engine is running. The sample container should be only partially full to permit thorough mixing of the contents before testing. The sample should be strained through 100-mesh wire screen to remove large particles which might affect the homogeneity of small test portions. Particles retained on the screen should be examined separately.

Dilution of Crankcase Oils:

A.S.T.M. Standard Method of Test for Dilution of Crankcase Oils (D 322 – 35).[3]

Water in Petroleum Products:

A.S.T.M. Standard Method of Test for Water in Petroleum Products and Other Bituminous Materials (D 95 – 40).[4]

Viscosity:

Kinematic, A.S.T.M. Tentative Method of Test for Kinematic Viscosity (D 445 – 39 T).[5]

Saybolt, A.S.T.M. Standard Method of Test for Viscosity by Means of the Saybolt Viscosimeter (D 88 – 38).[6]

[3] 1939 Book of A.S.T.M. Standards, Part III, p. 109.
[4] 1939 Book of A.S.T.M. Standards, Part III, p. 78.
[5] 1939 Book of A.S.T.M. Standards, Part III, p. 647.
[6] 1939 Book of A.S.T.M. Standards, Part II, p. 427; Part III, p. 216.

Carbon Residue:

Ramsbottom method, A.S.T.M. Tentative Method of Test for Carbon Residue of Petroleum Products (Ramsbottom Carbon Residue) (D 524 - 41 T).[7]

Conradson method, A.S.T.M. Method of Test for Carbon Residue of Petroleum Products (Conradson Carbon Residue) (D 189 - 41).[8]

Neutralization Number:

Proposed Method of Test for Neutralization Number of New and Used Crankcase Oils.[9]

Ash:

A.S.T.M. Tentative Method of Test for Ash Content of Petroleum Oils (D 482 - 38 T).[10] Ash determined by this method includes the nonvolatile inorganic matter, a portion of the volatile lead compounds, and a portion of the oil-soluble metallic compounds (soaps, addition agents). If nonmetallic inorganic material (silica, earth, etc.) is desired, the ash may be digested with acid, washed, dried, and weighed. The result is usually reported as "siliceous material" or "silica." Since a large portion of oil-soluble metal compounds is lost during combustion, a chemical analysis of the ash for metals is valueless.

Metal Content:

There is no standard or generally accepted method available. The commonest procedure is to burn the oil, as in the ash method, to the carbonaceous stage and to digest the carbon with acid. Oil-soluble metal compounds are definitely lost during the combustion step. Preferable methods are the digestion procedure of DeGray[11] and wet oxidation with perchloric acid.

Insoluble Material:

Although no standard or generally accepted methods are available, the various "insolubles" in used oils are the best available indication of the relative condition of the oil. In general, insolubles are determined by filtering the oil, or a 10 per cent solution of the oil in a solvent, through a Gooch type filter and washing, drying, and weighing the cake.[12] An infinite variety of results may be obtained by varying the filter density and the solvent used.

1. *Naphtha Insolubles.*—A.S.T.M. precipitation naphtha[13] is used as a flocculating naphtha to precipitate the extrinsic contaminants and asphaltenes.

2. *Chloroform Insolubles.*—The true insolubles in chloroform are obtained by using a fresh sample of used oil in chloroform which peptizes the bituminous material and precipitates the insolubles.

3. *Asphaltenes.*—By definition, are the naphtha insoluble, chloroform soluble material found by subtracting (2) from (1).

4. *Chloroform Solubles.*—"Chloroform solubles" is a term applied to the "nondrying portion" of the asphaltenes. It is determined by extracting the cake from the naphtha insolubles after drying in the oven with chloroform. During drying a portion of the asphaltenes oxidizes or dries to an insoluble condition. The remaining soluble portion as extracted with chloroform is the "chloroform solubles."

5. *Oil Insolubles.*—Oil insolubles are obtained by filtering the oil through cotton,[14] filter aid,[12] Seitz filter pads,[15] or similar material. The quantity is usually determined by the change in naphtha insolubles before and after filtering.

Resins:

The total oxidation products soluble in naphtha may be extracted from the naphtha solution with an adsorbent such as fuller's earth. The resin-free oil may be obtained by evaporating the naphtha.

Peptizing Value:

The ability of an oil to peptize or carry in suspension the contaminating material in a used oil may be approximated by blending 20 per cent of the used oil with 80 per cent of new oil and observing the rate of separation either at room or elevated temperatures. The method is of value for comparing the relative peptizing value of several oils used under the same conditions.

[7] 1941 Supplement to Book of A.S.T.M. Standards, Part III, p. 259.

[8] 1941 Supplement to Book of A.S.T.M. Standards, Part III, p. 5.

[9] Appendix III, 1941 Report of Committee D-2 on Petroleum Products and Lubricants, A.S.T.M. Standards on Petroleum Products and Lubricants, p. 19 (1941). (Issued as separate publication.)

[10] 1939 Book of A.S.T.M. Standards, Part III, p. 595.

[11] R. J. De Gray, *et al.*, "The Colorimetric Determination of Iron," pp. 181–185; "Colorimetric Determination of Lead," pp. 195–199; "Extraction of Metallic Constituents from Oil," pp. 209–212, Symposium on Analytical Methods Used in the Petroleum Industry, St. Louis Meeting, Am. Chemical Soc., April 7–11, 1941.

[12] L. L. Davis, "The Examination of Used Crankcase Oils," presented at an informal symposium sponsored by the A.S.T.M. Technical Committee B of Committee D-2, Chicago, Ill., June, 1941.

[13] Standard Method of Test for Precipitation Number of Lubricating Oils (D 91 - 40), 1940 Supplement to Book of A.S.T.M. Standards, Part III, p. 72.

[14] Harry Levin and Charles C. Towne, "Determination of Undissolved Sludge in Used Oils," *Industrial and Engineering Chemistry*, Analytical Edition, Vol. 11, p. 181 (1939).

[15] G. O. Ebrey, "Methods for Clarifying Oxidized or Used Mineral Oils and for the Determination of Sludge," pp. 255–267, Symposium on Analytical Methods Used in the Petroleum Industry, St. Louis Meeting, Am. Chemical Soc., April 7–11, 1941.

Index of X-ray Diffraction Data Available

A CARD INDEX OF X-ray diffraction data for use in the Hanawalt Method of Chemical Analysis by X-ray Diffraction has just been published by the Society. The data include not only Hanawalt's original published data, with his later corrections, but also additional data that have been contributed by Hanawalt, by the Aluminum Co. of America, and The New Jersey Zinc Co., together with data taken from the technical literature of the English language. It has been assembled by a joint committee of the National Research Council and the A.S.T.M., the personnel of which is made up of members of the Committee on X-ray and Electron Diffraction of the Division of Chemistry and Chemical Technology of the National Research Council and representatives from Committees E-3 on Chemical Analysis of Metals, Subcommittee VI of Committee E-4 on Metallography, and Subcommittee IV of Committee E-7 on Radiographic Testing of the A.S.T.M. The complete membership of the joint committee is as follows:

W. P. Davey, *Chairman*, School of Chemistry and Physics, The Pennsylvania State College.
W. L. Fink, Research Laboratory, Aluminum Company of America.
M. L. Fuller, Research Laboratory, New Jersey Zinc Co.
J. D. Hanawalt, Research Laboratory, Dow Chemical Co.
V. Hicks, Bureau of Ordnance, Navy Dept., Washington, D. C.
M. L. Huggins (*Ex-officio*), Research Laboratory, Eastman Kodak Co.
P. F. Kerr, Department of Geology and Mineralogy, Columbia University.
J. Magos, Research Division, Crane Co.
H. R. Nelson, Battelle Memorial Institute.
W. E. Richmond, U. S. Geological Survey, Washington, D. C.
L L. Wyman, Research Laboratory, General Electric Co.

The index, comprising approximately 4000 3- by 5-in. cards, identifies the three strongest lines in the X-ray diffraction pattern of some 1300 crystalline compounds.

The index in finished container boxes may be secured from the Society's Headquarters for $50 per set.

A.S.T.M. Books Throughout World

THERE ARE MANY unusual incidents which come to the attention of A.S.T.M. Headquarters, and if time were available, or publication space, interesting news statements could be prepared on some of these items. For example, statistics on the distribution of A.S.T.M. books would indicate that they get into some of the world's out-of-the-way corners. A reminder of this situation recently came to our attention when one of a considerable group of book dealers who distribute literature describing the Society's publications sent us a list of his clients indicating that he had distributed A.S.T.M. material to such places as Manono, Tschikapa, Aketi, Kindu, Usumbura, and Lukala. Members of the Society might have considerable difficulty in locating these places, but had we included in the list two additional towns given, namely, Leopoldville and Elisabethville, the problem might not have been so difficult, for they, of course, are named after the king and former queen of Belgium and are located in the Belgian Congo, Africa.

Chemical Symposium in Cleveland

UNDER THE AUSPICES of the Division of Industrial and Engineering Chemistry of the American Chemical Society the Eighth Annual Chemical Engineering Symposium dealing with Applied Thermodynamics will be held at Case School of Applied Science on Monday and Tuesday, December 29 and 30. Further details of the meeting can be obtained from C. F. Prutton, chairman of the Committee on Local Arrangements, who is Head of the Department of Chemical Engineering at Case.

Textile Chemists and Colorists Year Book

THE 1941 YEAR BOOK of the American Association of Textile Chemists and Colorists, covering some 760 pages, includes details of the organization set up and numerous committee reports but as in previous editions the major portion of the publication is devoted to the Standard A.A.T.C.C. Test Methods, alphabetical and geographical lists of the membership, and a tabulation of American dyes and textile chemical specialties.

While many A.S.T.M. members are active in the work of this association and use the publication, others should find it of distinct interest. To those concerned with references the report of the Subcommittee on Bibliography should be very helpful. Covering some 36 pages it classifies under ten sections the articles published in the English language on textiles during 1940. Classifications include General Chemistry; Vegetable, Animal, and Synthetic Fibers; Finishing and Sizing; Analysis, Testing, Standardization, and Color Matching; and others.

Copies of the book can be obtained from the Howes Publishing Co., 440 Fourth Ave., New York, N. Y., at $3.50 a copy.

A.S.T.M. Standards in Copper Price Schedule

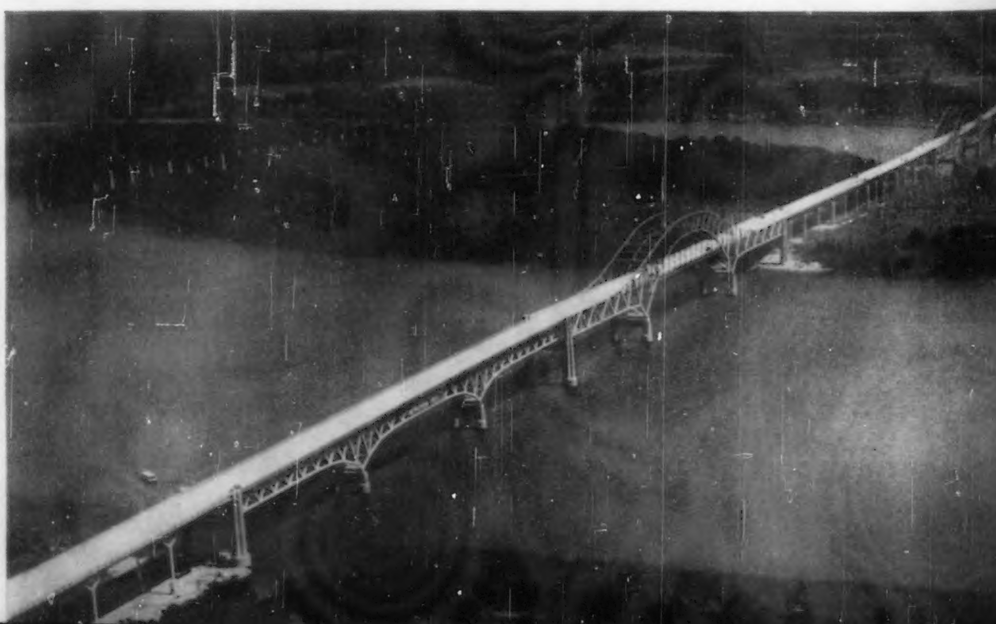
THE STANDARD SPECIFICATIONS and tests issued by A.S.T.M. are being used in a great number of ways in connection with National Defense activities and preparation. A recent example of such use involves the reprinting of the Standard Specifications for Lake Copper Wire Bars, Cakes, Slabs, Billets, Ingots, and Ingot Bars (B 4 – 27) and for Electrolytic Copper Wire Bars, Cakes, Slabs, Billets, Ingots, and Ingot Bars (B 5 – 27) in Price Schedule No. 15 issued by the Office of Price Administration and Civilian Supply. This schedule is to be reprinted and in Section 1309.60 the two standards will be published. The Society has been glad to give permission to the Office of Price Administration for such printing.

Susquehanna River Bridge, Awarded First Place, Class A, 1940, by the American Institute of Steel Construction, Inc.

In 1928 the American Institute of Steel Construction, Inc., established an annual award to demonstrate the aesthetics of bridges. Each year the bridges are selected by Juries of Award with the prizes donated by the A.I.S.C. which in May of this year issued a booklet to record growth and interest in this field and commemorate the achievements made.

The bridge shown above between Havre de Grace and Perryville, Md., built at a cost of over $4,000,000 was engineered by the J. E. Greiner Co., and fabricated by the Bethlehem Steel Co. for the Maryland State Roads Commission.

This beautiful structure is one of the end results of A.S.T.M. specifications, for the steel, cement, and other materials entering into the structure were covered, we are informed, by A.S.T.M. specifications. It is of further interest for the site of this bridge will always be one of historic interest for A.S.T.M. Not visible in this picture but off to the left a few hundred feet is the famed Havre de Grace bridge of the Pennsylvania Railroad Co. constructed in 1905 (not now in use), part of which was placed at the disposal of A.S.T.M. Committee D-1 on Preservative Coatings for Structural Materials so that it might conduct what proved to be one of the most extensive research projects ever sponsored by A.S.T.M. A large group of paint producers and consumers cooperated on the project which extended for some ten to twelve years to determine the best methods of preparing steel surfaces for painting and the most efficient coatings. From these tests came authoritative information and data of inestimable value to all interests concerned with problems which were vital then and are vital today.



Accelerated Testing of Plastics for Weathering Resistance

By L. K. Merrill[1] and C. S. Myers[1]

The laboratory testing of materials to determine their resistance to deterioration from prolonged outdoor exposure has always been a necessary part of commercial process and product development. This is particularly true with relatively new materials, such as plastics, and the acceleration of these tests—while at the same time maintaining a true correlation with the actual conditions of outdoor exposure—becomes of definite importance.

It is at once obvious that there is no such thing as standard "outdoor weather" and, therefore, the experimenter has no definite yardstick by which weathering resistance can be measured in a finite manner. Season, rainfall, latitude, elevation, and atmospheric contamination are all variable factors in relation to natural weathering in so far as they alter the exposures, effects of humidity, moisture, temperature, and the ultraviolet in sunlight. Similarly, these weathering factors may give quite different results in the type of degration they produce in exposed plastic parts. This will range through color change, surface crazing or chalking, warping, and dimensional distortion, to complete chemical disintegration. For these reasons, it is not so simple as it may at first appear to establish and measure the true conditions in accelerated testing for weathering behavior of plastic materials.

At this point it is well to point out that whereas data are herein recorded on the relative behavior of different plastic materials—primarily thermoplastics—these data have been accumulated primarily to establish the validity and accuracy of the method of test rather than to show the relative merits of the different plastics in their resistance to weathering exposure. This is particularly necessary because any commercial plastic may deteriorate during weathering on two distinctly different bases:

1. The chemical nature of the material itself will be a determining factor in its warpage, cracking, crazing, or dimensional change behavior—those factors having to do with mechanical deterioration.
2. The coloring material used may be subject to alteration from either temperature, light, or moisture, and completely mask or overshadow, as far as outward appearances are concerned, the mechanical factors and the true light stability of the uncolored plastic.

The fundamental light stability of the coloring ingredients, irrespective of the plastic involved, is an important and basic problem of the plastic material supplier and the subject of much intensive development effort. Therefore, because any plastic may fail in weathering resistance on either or both of these two counts, the accelerated test by which the material is judged should be sure to take both factors into consideration.

An extended series of tests was carried out during the summer and fall of 1940 in which the weathering behavior of a group of plastics (70 samples in all) was determined from exposure to outdoor conditions during 100 continuous days, starting July 30. Concurrently, samples of the same materials were exposed in the "National" Accelerated Weathering Unit, Model X-1-A (Fig. 1).

Meteorological data for the Cleveland area during the interval involved are shown in Table I and, for comparison, Fig. 2 shows the normal expectancy of available sunshine hours at this location. Actually, the outdoor weather exposure included a period of wide extremes in weather conditions marked by normal summer temperatures, and sunlight and warm rains, during the first half of the exposure period in August and September, followed by diminishing solar radiation, cold rains, snow, sleet, and frost in October and November. The determination of the actual hours of sunlight exposure experienced by the samples was complicated by the variability of sunlight from day to day and the diminution of the hours of sunlight available as the season progressed into the fall and winter months. Consequently, in correcting for the varia-

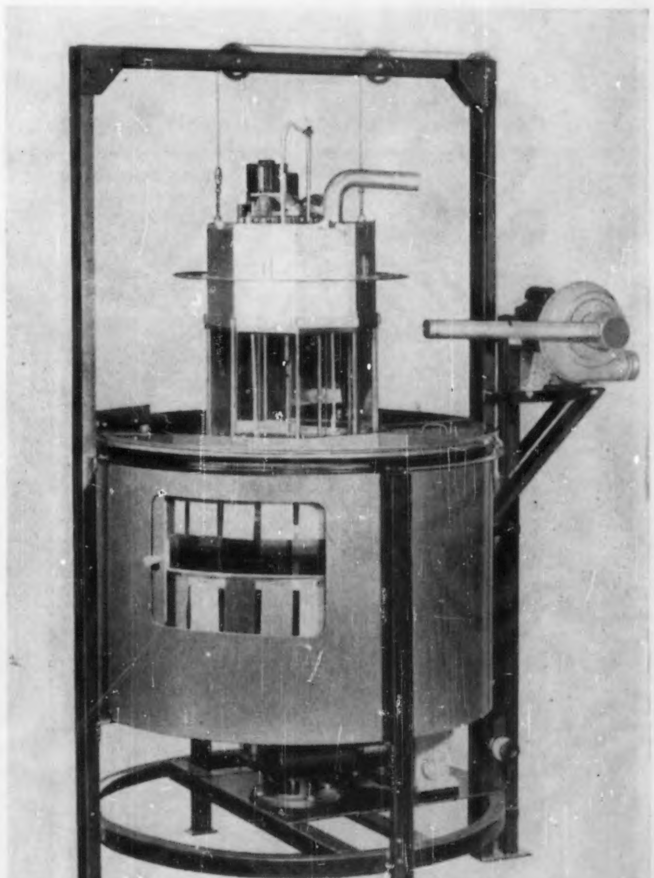


Fig. 1.—The "National" Accelerated Weathering Unit.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

[1] Development Engineer, Plastics Division, National Carbon Co., Inc., Cleveland, Ohio.

TABLE I—METEOROLOGICAL SUMMARY, CLEVELAND, OHIO, 1940.

From reports of Weather Bureau, U. S. Dept. of Commerce

Date	Precipitation, in.		Percentage of Sunshine	Cloudiness (Daylight Hours) Scale, 0 to 10[a]	Date	Precipitation, in.		Percentage of Sunshine	Cloudiness (Daylight Hours) Scale, 0 to 10[a]	Date	Precipitation, in.		Percentage of Sunshine	Cloudiness (Daylight Hours) Scale, 0 to 10[a]	Date	Precipitation, in.		Percentage of Sunshine	Cloudiness (Daylight Hours) Scale, 0 to 10[a]
	Total	Snowfall				Total	Snowfall				Total	Snowfall				Total	Snowfall		
July 30	0.00		94	2	Aug. 24	0.00		86	5	Sept. 18	0.00		83	4	Oct. 13	0.00		88	4
31	0.00		98	3	25	0.33		0	10	19	0.00		60	7	14	0.03		86	5
	0.00		Avg. 96	2.5	26	0.25		10	10	20	0.00		96	1	15	0.67		22	8
Aug. 1	0.00		99	1	27	0.45		26	10	21	Tr.		79	4	16	0.00		96	1
2	0.00		78	6	28	0.00		56	7	22	0.00		92	2	17	0.14		42	8
3	Tr.		87	4	29	0.05		53	8	23	0.00		84	6	18	0.00		43	8
4	Tr.		71	6	30	1.23		15	9	24	0.83		0	10	19	0.12	Tr.	0	10
5	0.36		46	8	31	0.19		77	4	25	0.01		17	9	20	Tr.		0	10
6	0.08		34	9		3.82		Avg. 66	5.9	26	0.00		91	2	21	0.01		23	9
7	0.00		100	1	Sept. 1	0.09		69	6	27	0.00		100	0	22	0.00		100	0
8	0.00		89	1	2	0.26		50	6	28	0.00		100	0	23	0.00		80	5
9	0.00		94	4	3	0.00		82	3	29	0.00		62	7	24	Tr.		100	2
10	0.00		64	8	4	0.00		100	1	30	0.00		75	6	25	Tr.		12	9
11	0.00		94	6	5	0.00		89	2		1.83		Avg. 65	5.2	26	0.00		75	4
12	0.00		88	4	6	0.00		100	1	Oct. 1	0.00		63	8	27	0.00		0	10
13	0.00		66	7	7	0.07		64	7	2	0.00		75	7	28	Tr.		24	9
14	0.00		93	1	8	0.01		54	7	3	0.00		93	4	29	0.36		0	10
15	0.00		90	3	9	0.06		30	9	4	0.00		97	1	30	Tr.		46	6
16	Tr.		68	7	10	0.02		13	9	5	Tr.		54	8	31	0.00		0	10
17	0.00		86	6	11	0.39		31	9	6	Tr.		81	5		1.39		Avg. 55	6.2
18	0.62		59	6	12	0.03		11	9	7	0.06		16	9	Nov. 1	0.63		0	10
19	0.04		47	8	13	0.00		83	5	8	0.00		67	5	2	0.00		89	2
20	0.01		64	6	14	0.06		26	9	9	0.00		75	4	3	0.00		86	4
21	0.00		92	3	15	Tr.		38	7	10	0.00		100	0	4	0.00		58	7
22	0.21		49	7	16	Tr.		77	5	11	Tr.		40	8	5	0.00		0	10
23	0.00		61	7	17	0.00		93	2	12	0.00		84	5	6	Tr.	Tr.	0	10

[a] Scale of cloudiness: Clear—scale, 0 to 3; partly cloudy—scale, 4 to 7; cloudy—scale, 8 to 10.

bilities associated with sunshine exposure, the following procedure was followed in order to calculate the probable sunshine exposure values for the samples subjected to the outdoor weathering tests:

A monthly average for the total number of hours of possible and effective daily sunshine during the months of July and August was approximated as 10 hr.; September, as 9 hr.; October, as 7 hr.; and November, as 6 hr. An examination of Fig. 2, as the average sunshine over a 7-yr. period, validates this approximation. The day-by-day "percentage of sunshine," as reported in Table I, was multiplied by the average hours of sunshine available in that month and the resulting summation of the actual hours of sunshine received by each sample was designated as the "net effective sunlight hours." It must be emphasized here that the expression, "net effective sunlight hours," does not completely define the characteristics or intensity of the solar energy to which the samples were exposed. The sunshine occurring early in the morning or late in the afternoon is relatively ineffective as compared to the direct sunshine falling on the samples in two or three hours of the midday. The intensity of winter noonday sun also does not compare with the intensity of summer noonday sun due to declination, atmospheric moisture, smoke, etc.

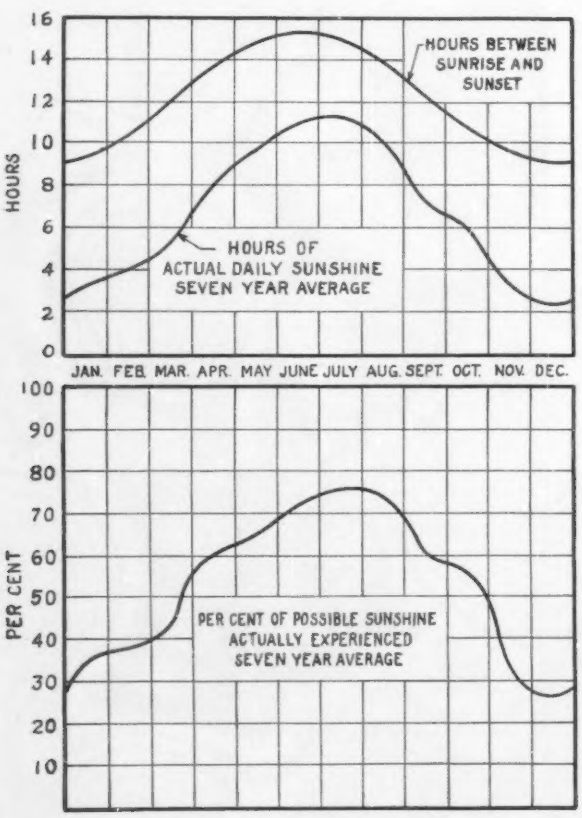


Fig. 2.—Record of Sunshine, Cleveland, Ohio. Average of seven consecutive years.

The outdoor weathering samples were inspected immediately after removal from the roof. They were then cleaned of soot by gently wiping them with a soft cloth dampened with a neutral soap suds, followed by a gentle wipe with a soft dry cloth. After cleaning, the samples were examined by reflected and transmitted light and the results of this visual examination were compared with the results recorded at the time the specimens were removed from the rack on the roof.

The energy distribution curve for the carbon arc used in the "National" X-1-A unit is shown in Fig. 3 and compared with that of natural noon sunshine during the month of June. The samples were fitted on the rack which makes one revolution every 2 hr. This rack may be seen through the open door in Fig. 1. On each revolution of the rack each sample received a bath of tap water from the continuously operating spray nozzles. Two pairs of "National" Sunshine Carbons, No. 22 ($^7/_8$ by 12 in.) upper carbons and No. 13 ($^1/_2$ by 12 in.) lower carbons, were

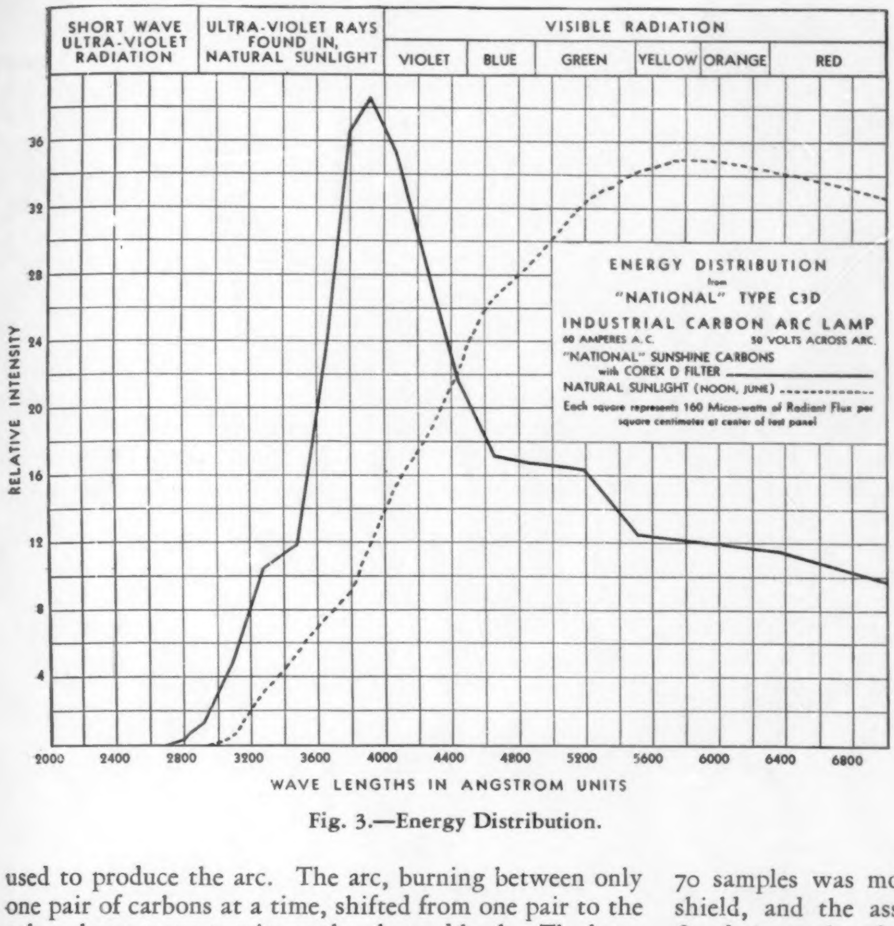


Fig. 3.—Energy Distribution.

used to produce the arc. The arc, burning between only one pair of carbons at a time, shifted from one pair to the other about every 40 min. as they burned back. The lamp operated at 60-amp. arc current with 50 v. across the arc. Panels of Corex D glass surrounded the arc and cut off the ultraviolet range of the spectrum below a wave length of 2700 Å. The samples were approximately $18^3/_4$ in. from the arc. A supplementary blower was used during the exposure tests to lower the ambient temperature of the samples in the outer shell to 120 to 105 F. This is an approximation of the temperature range produced, as the temperature of the unit is affected by room conditions. The ambient temperature of the samples, without the cooling provided by the supplementary blower, would have been approximately 135 F.

Sample holders were constructed from 0.020-in. tinned copper sheet as shown in Fig. 4. A shield, made from the same material, was constructed for each holder so as to mask three fourths of the sample mounted on the holder. In each corner of the sample holders and shield $^1/_8$-in. holes were drilled as indicated. Forty samples of eight plastics, in various colors, were available. Duplicate samples were used in most cases, making a total of 70 individual samples. Each of the 70 samples was mounted in a holder, covered with the shield, and the assembly secured by brass paper rivets fitted in each of the corner holes. Cadmium-plated washers were used as separators to prevent contact of the shield with the sample. The leakage of light through reflection under the shield on the shaded portion of the sample was prevented by bending the edges of the shield to contact with the sample.

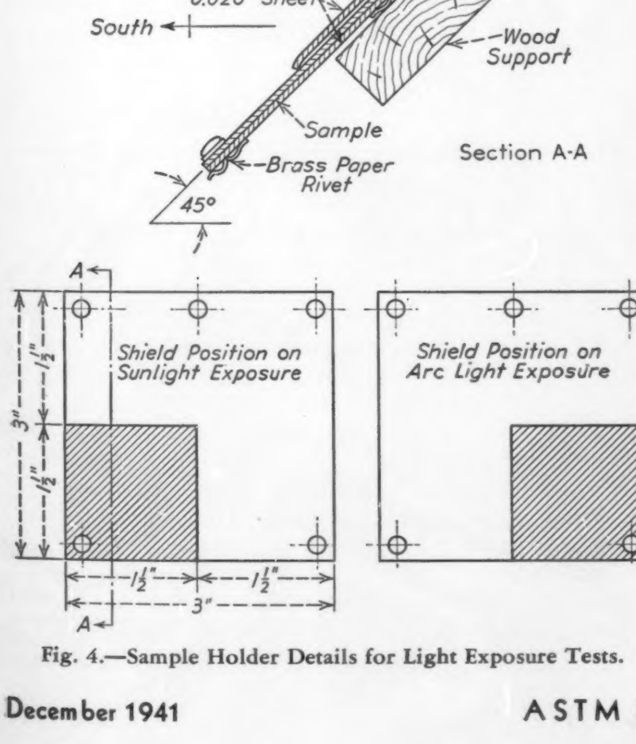


Fig. 4.—Sample Holder Details for Light Exposure Tests.

In the outdoor weathering tests, the lower left-hand one fourth portion of the sample was exposed, as shown in Fig. 4. All of the samples were mounted on a wooden rack located on the laboratory roof. The rack was faced

TABLE II.—CORRELATION OF OUTDOOR WEATHERING AND "NATIONAL" ACCELERATED WEATHERING (X-1-A UNIT) TESTS IN SAMPLES OF APPROXIMATELY EQUIVALENT COLOR CHANGE.

Sample	Material	Outdoor Weathering		X-1-A Exposure, hr.	Ratio X[a]	Ratio Y[b]
		Net Effective Sunlight, hr.	Total Exposure, hr.			
No. 18	"Vinylite" sheets	524.4	2361	143	3.7	16.2
No. 23A	"Vinylite" sheets	194.1	647	145	1.34	4.5
No. 24A	"Vinylite" sheets	194.1	647	145	1.34	4.5
No. 25A	"Vinylite" sheets	194.1	647	145	1.34	4.5
No. 28	"Vinylite" plasticized	194.1	647	96	2.0	6.8
No. 29	Methacrylate	524	2361	193	2.7	12.2
No. 31	Urea-formaldehyde	81.4	231	4.33	1.9[c]	53.0[c]
No. 36	Cellulose acetate	419	1592	145	2.9	11.0
No. 39	Cellulose acetate	193.1	647	145	1.3	4.5
No. 40	Cellulose nitrate	419	1592	145	2.9	11.0
No. 41	Cellulose nitrate	524.4	2361	193	2.7	12.2
No. 44	Cellulose nitrate	122.9	356	96	1.3	3.7
No. 45	Cellulose nitrate	193.1	647	193	1.0	3.35
No. 51	Polystyrene	419.4	1592	193	2.2	8.2
No. 54	Polystyrene	446	1741	193	2.3	9.0
Avg.					2.07	7.98

[a] Ratio of $\frac{\text{net effective sunlight (outdoor) hours}}{\text{X-1-A exposure hours}}$.

[b] Ratio of $\frac{\text{total exposure (outdoor) hours}}{\text{X-1-A exposure hours}}$.

[c] Excluded in the average.

TABLE III.—SUMMARY OF RESULTS OF OUTDOOR WEATHERING AND ACCELERATED WEATHERING UNIT TESTS.

Sample	Material	Designation	Color	Thickness, in.	Surface	Outdoor Weathering Test: First Appreciable Color Change: Net Effective Sunlight, hr.	Outdoor: First Appreciable: Total Exposure, hr.	Outdoor: First Appreciable: Change Produced	Outdoor: Advanced Color Change: Net Effective Sunlight, hr.	Outdoor: Advanced: Total Exposure, hr.	Outdoor: Advanced: Change Produced	"National" Accelerated Weathering Unit Tests: First Appreciable Change: Net Exposure, hr.	"National": First Appreciable: Change Produced	"National": Advanced Color Change: Net Exposure, hr.	"National": Advanced: Change Produced
No. 1	"Vinylite" X sheet	G-1110	Clear	0.020	Polished	419	1592	Warped, bleached	...	...	......	46	Warped, bleached	...	......
No. 2						...	..	......	524.4	2361	Slight yellowing	....	......	143	Warped, bleached, slightly yellow
No. 3	"Vinylite" plastic film	F-4043	Clear	0.004	Calendered	371	1407	Stiffened, dark[a]	...	..	......	48	Stiffened, slightly dark	....	......
No. 4						...	..	......	446	1741	Stiffened, dark[a]	....	......	145	Stiffened, slightly dark
No. 5	"Vinylite" X sheet	R-3396	Green	0.008	Polished	30	71	Warped, slightly dark	...	..	......	24	Slightly dark, yellow	...	......
No. 6						...	..	......	299.6	1143	Warped, badly faded	....	......	145	Warped, faded
No. 7	"Vinylite" V sheet	VS 3300	Scarlet	0.021	Polished	17.5	43	Darkened	...	..	......	1	Slightly dark	...	......
No. 8						...	..	......	371.2	1407	Badly faded	....	......	96	Darkened, faded
No. 9	"Vinylite" V sheet	VS 1300	Amber	0.021	Polished	29.3	71	Faded, darkened	...	..	......	4	Slightly faded	...	......
No. 10						...	..	......	371.2	1407	Badly faded	....	......	145	Darkened, faded
No. 11	"Vinylite" V sheet	VS 3300	Purple	0.022	Polished	29.3	71	Faded	...	..	......	2	Slightly faded	...	......
No. 12						...	..	......	299.6	1143	Badly faded	....	......	145	Darkened, faded
No. 13	"Vinylite" V sheet	VS 5300	White	0.021	Polished	81.4	239	Darkened	...	..	......	24	Faded, yellow	...	......
No. 14						...	..	......	299.6	1143	Darkened	....	......	96	Darkened, faded
No. 15	"Vinylite" V sheet	VS 3300	White	0.021	Polished	372.2	1407	Slight yellow	...	..	......	24	Slightly darkened	...	......
No. 16						...	..	......	524.4	2361	Yellow, darkened	....	......	96	Darkened
No. 17	"Vinylite" V sheet	VS 1310	Clear	0.020	Polished	419	1592	Slight yellow	...	..	......	46	Faded, yellowing	...	......
No. 18						...	..	......	524.4	2361	Slightly yellow	....	......	143	Faded, yellow
No. 19	"Vinylite" plastic film	F-4353	Light orchid	0.004	Calendered	29.3	71	Slightly faded	...	..	......	2	Faded	...	......
No. 20						...	..	......	299.6	1143	Stiffened, total fade	....	......	96	Darkened, faded
No. 21	"Vinylite" plastic film	F-4380	Dark orchid	0.004	Calendered	29.3	71	Faded	...	..	......	2	Slightly faded	...	......
No. 22						...	..	......	371.3	1407	Stiffened, total fade	....	......	96	Completely faded
No. 23	"Vinylite" V sheet	VS 3300	Red	0.020	Polished	81.4	239	Slightly faded	...	..	......	96	Slightly faded	...	......
No. 23A						...	..	......	194.1	647	Faded	....	......	145	Faded
No. 24	"Vinylite" V sheet	VS 3300	Green	0.027	Polished	81.4	239	Slightly dark	...	..	......	4.33	Brighter	...	......
No. 24A						...	..	......	194.1	647	Darkened	....	......	145	Darkened
No. 25	"Vinylite" V sheet	VS 5300	Ivory	0.020	Polished	17.5	43	Faded, slightly dark	...	..	......	2	Slightly darkened	...	......
No. 25A						...	..	......	194.1	647	Faded, slightly darkened	....	......	145	Darkened, bleached
No. 26	"Vinylite" V sheet	VS 1310	Clear	0.020	Polished	419	1592	Slightly yellow	...	..	......	48	Slightly yellow	...	......
No. 26A						...	..	......	524.4	2361	Slightly yellow	....	......	145	Yellow
No. 27	"Vinylite" plastic tubing	VT 1900	Amber	0.025	Extruded	29.3	71	Faded	...	..	......	4.33	Slightly faded	...	......
No. 28						...	..	......	193.1	647	Totally faded	....	......	96	Faded
No 29	Methacrylate	...	Clear	0.127	Polished	524	2361	Slightly darkened	...	..	......	....	......	193	Darkened
No. 30	Methacrylate	...	Clear, red	0.122	Polished	524	2361	No change	...	..	......	....	......	193	No change
No. 31	Urea-formaldehyde	(Filled)	White	Molded	Polished	81.4	239	Darkened	...	..	......	4.33	Slightly darkened	....	......
No. 32	Urea-formaldehyde	(Unfilled)	White	Molded	Polished	81.4	239	Lighter	...	..	......	....	......	193	Slightly darkened
No 33	Urea-formaldehyde	(Filled)	Red	Molded	Polished	524	2361	No change	...	..	......	....	......	193	Darkened
No. 34	Cellulose acetate	2	White	0.010	Sliced	300	1143	Warped, lighter[b]	...	..	......	145	Warped, chalked	...	......
No. 35						...	..	......	524.4	2361	Warped, lighter, chalked	....	......	193	Warped, lighter, chalked
No. 36	Cellulose acetate	4	Blue	0.012	Sliced	419	1592	Warped, dulled	...	..	......	145	Warped, dulled	...	......
No. 37						...	..	......	524.4	2361	Warped, lighter, faded	....	......	193	Warped, faded
No. 38	Cellulose acetate	3	Pink	0.010	Sliced	81.4	239	Slightly faded	...	..	......	24	Slightly faded	...	......
No. 39						...	..	......	193.1	647	Warped, faded	....	......	145	Faded
No. 40	Cellulose nitrate	12	White	0.0105	Sliced	419	1592	Lighter, slightly brown	...	..	......	145	Yellow	...	......
No. 41						...	..	......	524.4	2361	Lighter, slightly brown	....	......	193	Darkened
No. 42	Cellulose nitrate	13	Rose	0.011	Sliced	17.5	43	Faded	...	..	......	....	......	96	Faded
No. 43						...	..	......	193.1	647	Badly faded	2	Faded	....	......
No. 44	Cellulose nitrate	14	Blue	0.009	Sliced	122.9	356	Faded to green	...	..	......	96	Faded to green	...	......
No. 45						...	..	......	193.1	647	Faded to green	....	......	193	Faded to green
No. 46	Cellulose nitrate	15	Green	0.011	Sliced	81.4	239	Slightly darkened	...	..	......	....	......	145	Faded, darkened
No. 47						...	..	......	193.1	647	Slightly darkened	96	Faded, darkened	....	......
No. 48	Cellulose nitrate	16	Red	0.016	Sliced	194.1	647	Brighter	...	..	......	96	Brightened	...	......
No. 49						...	..	......	524.4	2361	Brighter[c]	....	......	145	Brightened
No. 50	Polystyrene, colorless	...	Clear	0.095	Polished	299.6	1143	Yellow	...	..	......	....	......	...	......
No. 51						...	..	......	419.4	1592	Yellow	....	......	193	Yellow
No. 52	Polystyrene, translucent	...	Blue	0.095	Polished	17.5	43	Complete fading	...	..	......	....	......	24	Completely faded
No. 53						...	..	......	81.4	239	Complete fading	0.5	Seriously faded	...	......
No. 54	Polystyrene, clear	...	Amber	0.095	Polished	446	1741	Slightly faded	...	..	......	....	......	193	Faded, checked
No. 55						...	..	......	524.4	2361	Slightly faded	....	......	193	Faded, checked
No. 56	Cellulose nitrate	...	Flesh	0.0175	Sliced	193.1	647	Slightly faded	...	..	......	24	Faded, darkened	...	......
No. 57						...	..	......	446	1741	Slightly faded	....	......	96	Faded, darkened
No. 58	"Vinylite" V	R-3697-A	Flesh	0.014	Polished	17.5	43	Slightly faded	...	..	......	2	Darkened, mottled	...	......
No. 59						...	..	......	193.1	647	Faded	....	......	12.33	Darkened, mottled
No. 60	"Vinylite" V	R-3749	Flesh	0.013	Polished	17.5	43	Slightly faded	...	..	......	....	......	12.33	Darkened, mottled
No. 61						...	..	......	193.1	647	Faded	1	Darkened, mottled	...	......
No. 62	"Vinylite" V	R-3946	Clear	0.020	Polished	...	..	......	...	..	......	....	......	193	Slightly yellowed
No. 63	"Vinylite" V	R-3946-A	Clear	0.020	Polished	...	..	......	...	..	......	....	......	193	Slightly yellowed
No. 64	"Vinylite" V	R-3948	Clear	0.020	Polished	...	..	......	...	..	......	....	......	193	Slightly yellowed
No. 65	"Vinylite" V	R-3949	Clear	0.020	Polished	...	..	......	...	..	......	....	......	193	Slightly yellowed
No. 66	"Vinylite" Plasticized	R-4080	White	0.060	Calendered	...	..	......	...	..	......	....	......	193	Slightly yellowed

[a] Dark brown and mottled coloration developed after removal from test.
[b] Chalked.
[c] Developed checking and chalking after removal from test.

due south with the specimens inclined at an angle of 45 deg. from the horizontal. The roof was black, essentially flat, and not shaded by obstructions at any time during the day.

For accelerated weather testing, the shields on the sample holders were removed and reattached as shown in Fig. 4 to expose the lower right one fourth of the specimen. The samples were placed on test in the "National" Accelerated Weathering Unit at 10:45 a.m. on December 2, 1940. An examination of the samples was made at elapsed exposure periods of 0.25, 0.50, 1.0, 2.0, 4.33, 12.33, 24.0, 48.0, 96.0, and 145 hr. The individual samples were removed from test at the first appreciable evidence of color change and the duplicate of the sample removed was allowed to remain in the unit until the change in color was seriously advanced. The comparison of the effects produced in each of the outdoor weathering and the "National" X-1-A Weathering Unit tests were tabulated. The two results given for each sample under each of the two methods of test correspond to the first appreciable change in color and the more advanced change in color caused by longer exposure.

A number of the samples were removed from test when the color changes produced by the two methods of exposure were roughly equivalent. The exposure data for these samples are shown in Table II. The comparison of the exposure data allowed the establishment of ratios of outdoor sunshine and total outdoor exposure equivalent to exposures in the accelerated testing unit.

Table III shows the details of the data accumulated. They serve to substantiate the following conclusions:

1. In 86 per cent of the 70 samples tested, the "National" Accelerated Weathering Unit, Model X-1-A, effectively reproduced, in an accelerated manner, the color changes produced by outdoor exposure. Inconsistencies resulted in the other cases, influenced (for the greater part) by unreproduced moisture treatment that altered the nature of color failure or caused serious "chalking."

2. Exposure of 1 hr. in the "National" Accelerated Weathering Unit results in color and weathering changes equivalent to those produced by 2 hr. of natural sunlight during approximately 8 hr. of total outdoor exposure during the period between August 1 and November 1, 1940.

3. The transparent plastics, both clear and colored, possessed better light stability than the opaque or translucent materials, since less of the spectral energy causing decomposition was absorbed in the transparent materials.

4. The coloring material compounded in the plastic was the greatest factor in determining the ultimate light stability, or resistance to color change, of the plastic on weathering exposure. Conversely, the type of plastic influenced to only a slight degree the ultimate color stability of the exposed samples. Samples with the poorest or with the best light stability were often of the same type of plastic but containing different coloring agents or added opacifiers. The type of plastic and its water resistance did, however, affect dimensional stability and resistance to "chalking" during weathering tests.

5. It is believed that the "National" Accelerated Weathering Unit enables one to predict, with considerable accuracy and safety, the results which will be obtained when plastics are exposed to normal outdoor weathering, and that this type of accelerated weathering test includes all of the important factors contributing to the results in a manner more closely duplicating actual outdoor exposure conditions than do tests of a more empirical type. This is true because of the factors of

(*a*) closer approximation to characteristics of true solar energy,
(*b*) control of temperature of exposure,
(*c*) control of humidity during exposure, and
(*d*) control of thermal shock and contact moisture factors.

All of these features have previously been confirmed by experience in accelerated weathering testing of surface coatings, fabrics both plain and coated, dyes, pigments, etc., so its was expected that the unit would be equally applicable to plastic materials. The accuracy and reproducibility of the tests, however, far exceeded expectations.

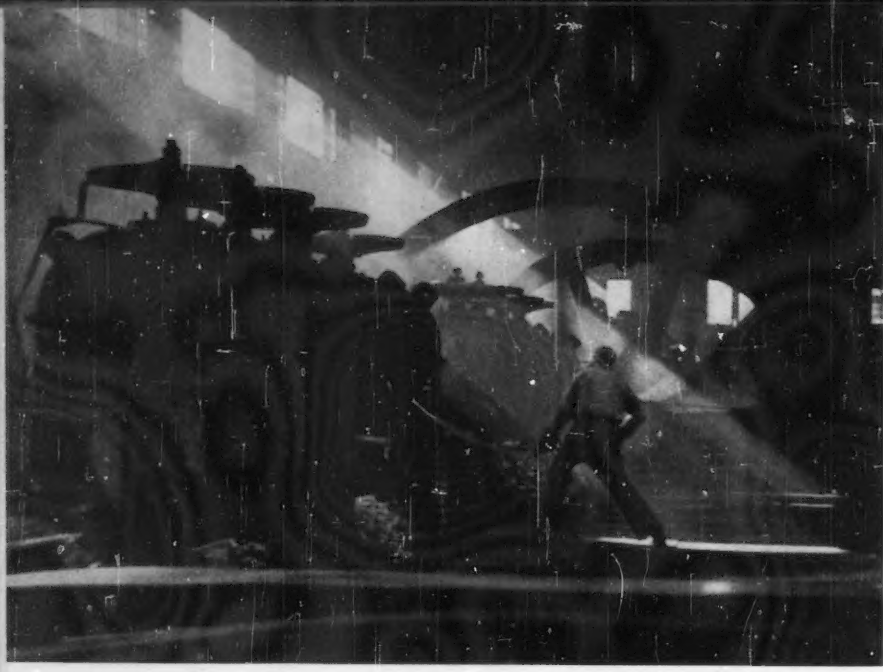
Casting Specifications Stocked by A.F.A. Office

For many years there has been close cooperation between the American Foundrymen's Association and A.S.T.M., a series of outstanding technical symposiums on cast iron, steel castings, and malleable iron castings having resulted from the cooperative work; the A.F.A. is actively represented on many A.S.T.M. committees and, of course, many A.F.A. members are also affiliated with A.S.T.M.

Recently the Association has included in its news bulletin, *American Foundryman*, articles dealing with A.S.T.M. specifications of concern to the foundryman. Because of interest in the work and for the convenience of its members there are now being stocked at A.F.A. Headquarters, 222 W. Adams St., Chicago, a supply of the A.S.T.M. specifications and tests pertaining to the foundry field. A list of the specifications which can be obtained from the Foundrymen Headquarters as well as from A.S.T.M. Headquarter follows:

A 27 – 39	A 157 – 41	B 26 – 41 T
A 44 – 41	A 159 – 41	B 58 – 41 T
A 46 – 30 T	A 197 – 39	B 148 – 41 T
A 47 – 33	A 198 – 39	B 60 – 41
A 48 – 41	A 215 – 41	B 61 – 41
A 74 – 39 T	A 216 – 41 T	B 62 – 41
A 87 – 36	A 217 – 41 T	B 66 – 38
A 95 – 41	A 220 – 39 T	B 144 – 41 T
A 119 – 33	A 221 – 39	B 80 – 41 T
A 126 – 40	A 222 – 39	B 93 – 41 T
A 128 – 33	A 223 – 39	B 108 – 41 T
A 142 – 38	B 30 – 41 T	B 112 – 41 T
A 148 – 36	B 22 – 40 T	B 119 – 40 T
		B 132 – 41 T

The regular price of 25 cents for 1 to 9 copies applies; 10 to 49 copies, 20 cents each; 25 to 99 copies, $17^{1}/_{2}$ cents each.



"The Rolls"

Third prize-winning photograph, Nonprofessional, in the Fourth A.S.T.M. Photographic Exhibit, by W. F. Crawford, Edward Valve and Manufacturing Co., Inc.

A.S.T.M. Standards in Winston-Salem Code

MANY MUNICIPAL and state building codes incorporate by reference A.S.T.M. specifications and tests to govern the quality of materials entering into buildings. The Uniform Building Code promulgated by the Pacific Coast Building Officials Conference is a notable example with some 47 Society standards incorporated.

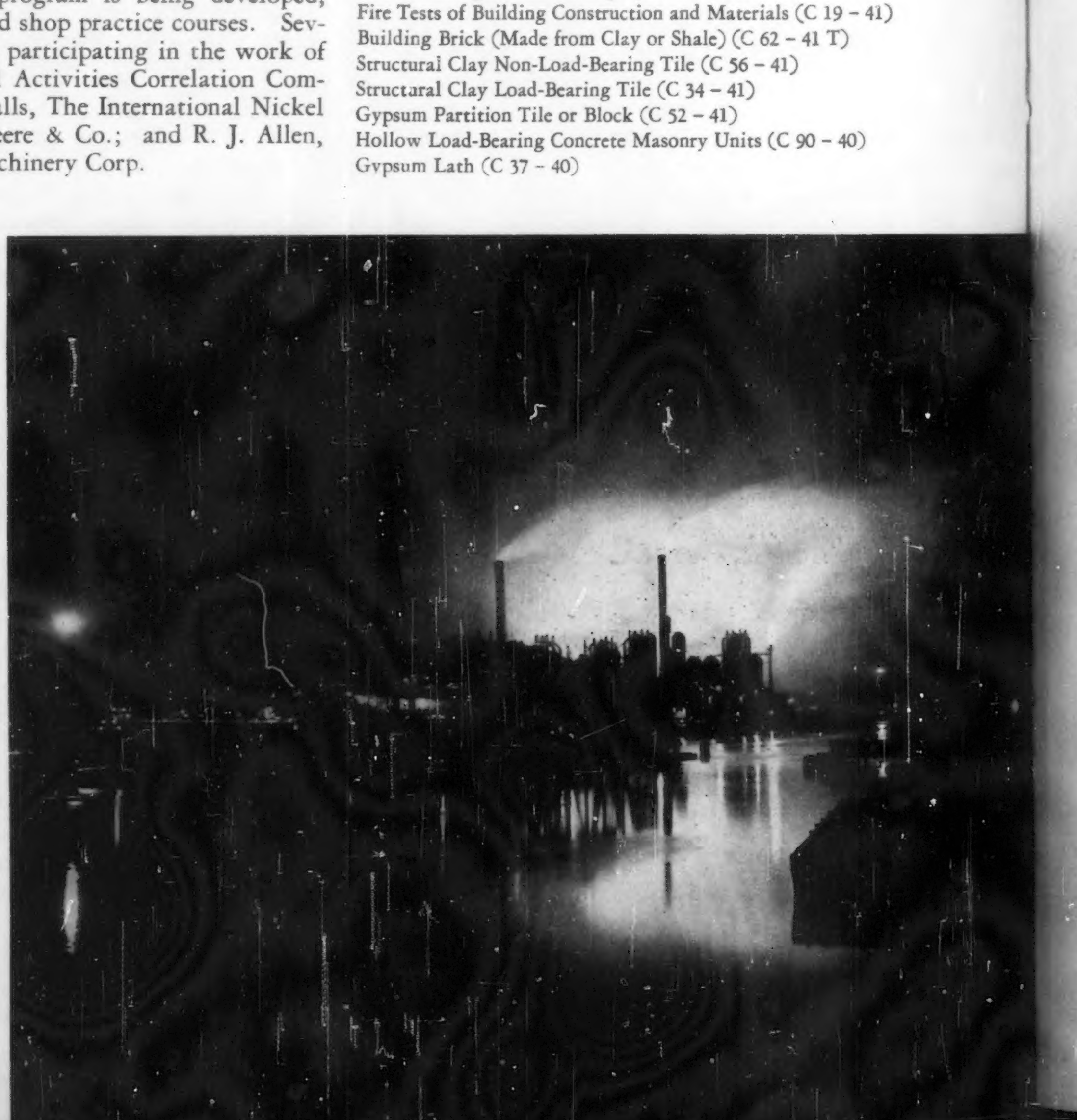
Recently the city of Winston-Salem, N. C., has adopted an official building code prepared with the assistance of many building interests in this community and a number of A.S.T.M. standards are embodied in the code. It is set up so that the latest A.S.T.M. standards always apply. These cover the following:

Steel for Bridges and Buildings (A 7 – 39)
Fire Tests of Building Construction and Materials (C 19 – 41)
Building Brick (Made from Clay or Shale) (C 62 – 41 T)
Structural Clay Non-Load-Bearing Tile (C 56 – 41)
Structural Clay Load-Bearing Tile (C 34 – 41)
Gypsum Partition Tile or Block (C 52 – 41)
Hollow Load-Bearing Concrete Masonry Units (C 90 – 40)
Gypsum Lath (C 37 – 40)

Foundry Show in Cleveland, April, 1942

ANNOUNCEMENT HAS been received from the American Foundrymen's Association that the 1942 Foundry and Allied Industries Show will be held at the Cleveland Auditorium and Exhibition Hall, April 18 to 24, with the Northeastern Ohio Chapter of the A.F.A. acting as hosts during the Forty-sixth Annual Convention. Educational features are being sponsored including an extensive exhibition of ordnance equipment and related material.

An extensive technical program is being developed, including lecture courses and shop practice courses. Several A.S.T.M. members are participating in the work of the Association's Technical Activities Correlation Committee including: F. J. Walls, The International Nickel Co.; Hyman Bornstein, Deere & Co.; and R. J. Allen, Worthington Pump and Machinery Corp.



"Night Magic"

Second prize-winning photograph, Professional, in the Fourth A.S.T.M. Photographic Exhibit, by Thor Nielsen, Carnegie-Illinois Steel Corp.

Comparison of Dynamical with Other Measurements of Mortar Bars Exposed to Sulfate Solutions

By F. B. Hornibrook[1]

The considerable disintegration of concrete caused by aggressive soil solutions has stimulated efforts to develop satisfactory short-time tests to evaluate the resistance of various cements to that type of disintegration. This paper briefly summarizes some results obtained in a series of observations, exploratory in scope, made of the changes in modulus of elasticity as determined by a dynamic method and of the linear expansions and the flexural strengths of mortar bars subjected to sulfate solutions.

Scope and Test Procedure

The measurements were made on sixteen 2-by 2-by 10-in. specimens representing 16 controlled variables, as listed in Table I. The specimens were fabricated from a mortar proportioned 1:5 parts by weight of cement and of standard 20–30 Ottawa sand. After molding, the specimens were cured in moist air for one day, then in water until the age of either 7 or 28 days, at which age they were exposed to sulfate solutions.

TABLE I.—DESCRIPTION OF TESTS.

Cement	Total Number of Specimens	Curing Time, days	Specimen Exposed: Na_2SO_4 Solution, Continuous Immersion	Na_2SO_4 Solution, Repeated Immersion	$MgSO_4$ Solution, Continuous Immersion	$MgSO_4$ Solution, Repeated Immersion
Standard portland cement complying with SS-C-191a, C_3A content = 12%	4	7	No. 1	No. 3	No. 2	No. 4
	4	28	No. 5	No. 7	No. 6	No. 8
Moderate heat of hardening cement complying with SS-C-206, C_3A content = 6%	4	7	No. 9	No. 11	No. 10	No. 12
	4	28	No. 13	No. 15	No. 14	No. 16

As indicated in the table, there were two types of exposure for each of the two sulfate solutions: one a continuous immersion in the sulfate solution; and the other a repeated immersion cycle. Each cycle consisted of 18 hr. in the sulfate solution, followed by 18 to 20 hr. of drying in an oven in which the temperature varied from 95 to 110 C. This cycle is similar to that described in the A.S.T.M. Tentative Method of Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate (C 88 – 41 T).[2]

The specimens in continuous immersion were removed from the solution and their linear expansion measured in a micrometer dial comparator every 7 days; the modulus of elasticity was also determined at that time by the dynamic method.[3]

The specimens subjected to repeated immersion were measured for linear expansion and for modulus of elasticity immediately after each removal from the sulfate solution and again after each oven drying.

Upon termination of the sulfate exposures all the specimens which were still reasonably intact were tested for flexural strength.

Test Results

The appearances at the end of the sulfate tests of all the specimens that had been cured 7 days are shown in Fig. 1. The relationships between length of time of immersion of these specimens, except Nos. 11 and 12, to sulfate solutions and the linear expansion and also the changes in modulus of elasticity, both expressed as percentages, are shown in Figs. 2 and 3. The relationships obtained for specimens Nos. 11 and 12 were essentially the same as those for specimens Nos. 3 and 4 (Fig. 3), respectively, and are not presented.

The continuous immersion results, shown in Fig. 2, indicate for 6 per cent tricalcium aluminate cement a rela-

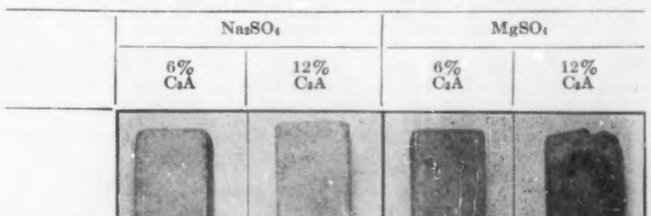


Fig. 1.—Appearance of 7-day Cured Specimens After Termination of the Sulfate Exposure.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for the attention of the author. Address all communications to A.S.T.M. Headquarters, 260 S. Broad St., Philadelphia, Pa.

[1] Materials Engineer, National Bureau of Standards, Washington, D. C.

[2] 1941 Supplement to Book of A.S.T.M. Standards, Part II, p. 327.

[3] F. B. Hornibrook, "Application of Sonic Method to Freezing and Thawing Studies of Concrete," ASTM Bulletin, No. 101, December, 1939, p. 5.

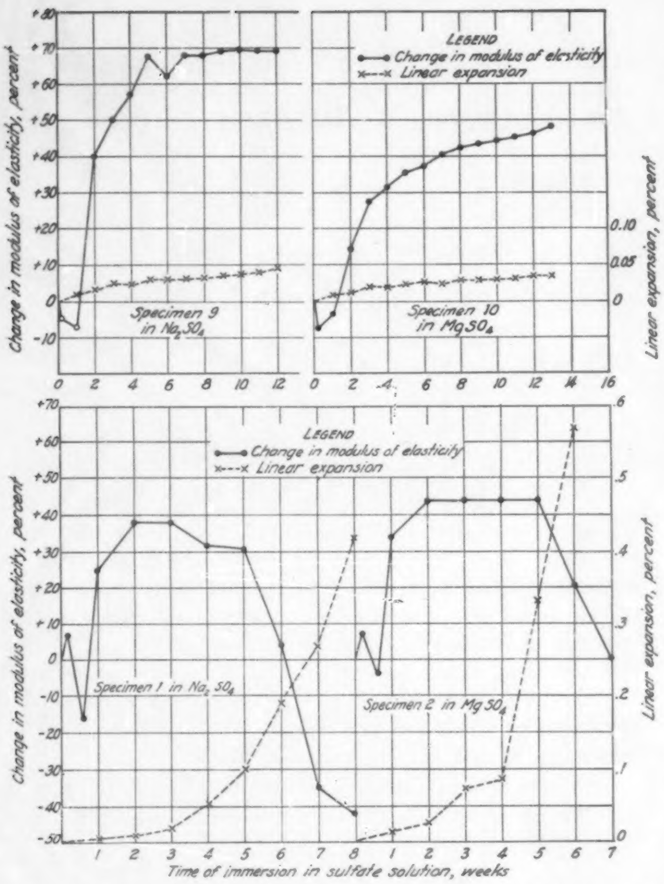


Fig. 2.—Change in Modulus of Elasticity and Increase in Length with Time of Continuous Sulfate Immersion for 7-day Cured Specimens.

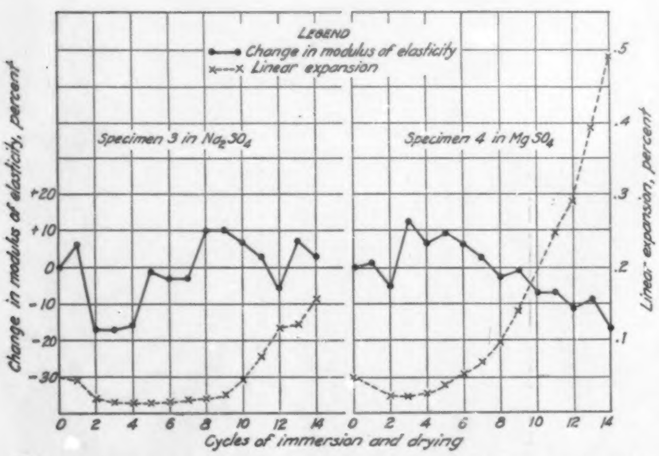


Fig. 3.—Change in Modulus of Elasticity and Increase in Length with Cycles of Immersion in Sulfate Solution Followed by Oven Drying for 7-day Cured Specimens.

tively low linear expansion and a high modulus of elasticity even after 12 weeks' immersion. The results obtained with 12 per cent tricalcium aluminate cement show a rapid increase in the linear expansion of the specimens, beginning at about the third week, but the values for modulus of elasticity reached a maximum after about 3 weeks and decreased rapidly after about the fifth week.

The results, not shown, for the specimens cured 28 days gave the same characteristic curves as those shown in Fig. 2. The increase in modulus of elasticity during the first several weeks' exposure was not so great, amounting to only 20 per cent but, because of the longer curing period, the initial value was greater than for the 7-day cured specimens.

The results obtained from the repeated immersion of the two specimens made with 12 per cent tricalcium aluminate cement and cured for 7 days are shown in Fig. 3. These measurements were made immediately after the immersion period, and were considered as typical of the results obtained from the saturated specimens for all the repeated-immersion tests. That is, the modulus of elasticity tended to vary somewhat erratically, although the linear expansion was fairly uniform. No significant difference appeared between the low and the high C_3A cements, but $MgSO_4$ appeared to produce greater linear expansion than did Na_2SO_4. The results, not presented, for the same specimens measured after the oven drying were exceedingly erratic; this may have been caused by the lack of rigidly controlled drying conditions.

It can be seen from Figs. 1 and 3 that there was a characteristic difference in the type of disintegration caused by the Na_2SO_4 and by the $MgSO_4$ solutions for the repeated immersion cycle. The specimens in Na_2SO_4 (Nos. 3 and 11) disintegrated from the surface inward, but the modulus of elasticity was not materially changed during the exposure and the linear expansion was not excessive. This, then, is a type of disintegration which neither linear expansion nor measurements of modulus of elasticity will adequately evaluate. On the other hand, the specimens exposed to $MgSO_4$ solution (Nos. 4 and 12) underwent practically no change in appearance, but the linear expansion was excessive and modulus of elasticity decreased considerably.

In Fig. 4, modulus of elasticity and also the linear expansions are plotted against the modulus of rupture for the specimens remaining intact after the sulfate exposure. The scales of the modulus of elasticity and of linear expansion were arranged in relation to each other so that the horizontal line drawn on the graph at 0.2 per cent linear expansion corresponds to 2,500,000 psi. modulus of elasticity. It so happens that all specimens having expansion greater than 0.2 per cent, a value often used as a criterion

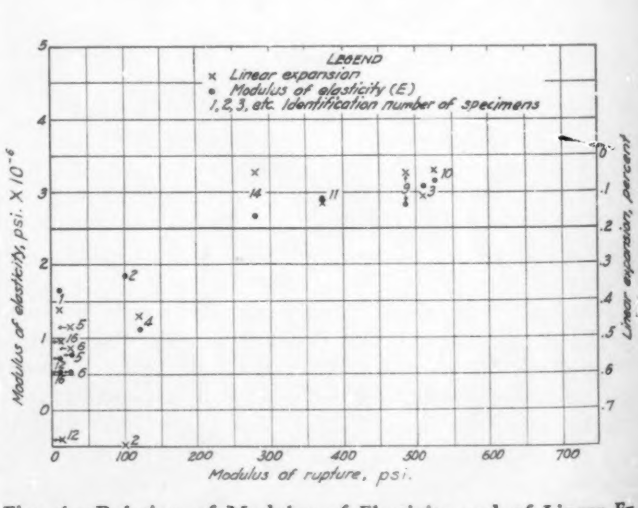


Fig. 4.—Relation of Modulus of Elasticity and of Linear Expansion to Modulus of Rupture.

Suggests the classification of specimens into 2 groups based on linear expansions of greater than 0.2 per cent or modulus of elasticity lower than 2,500,000 psi.

of failure in expansion studies, also have a modulus of elasticity lower than 2,500,000 psi.

The data in Fig. 4 indicate, therefore, that some selected value of modulus of elasticity might be used instead of a selected value of expansion as a criterion of deterioration. The particular value selected would, it is expected, vary with the mix proportions, curing conditions, etc.

Conclusions

It was found that specimens which had withstood 9 weeks or more of continuous immersion or 14 cycles or more of repeated immersion in sulfate solutions without expanding linearly as much as 0.2 per cent also had a modulus of elasticity greater than 2,500,000 psi. The specimens which had expanded 0.2 per cent or more during the sulfate exposure had a modulus of elasticity less than 2,500,000 psi. Accordingly, a criterion of the relative resistance of mortar bars to the aggressive action of sulfate solutions might be the length of time of exposure to cause the modulus of elasticity to decrease to a given level (which was 2,500,000 psi. in the present study). The criterion might also be the relative values of modulus of elasticity of specimens which had expanded by a given amount, say 0.2 per cent. Further study will be required to ascertain whether these suggested criteria will correlate satisfactorily with the results of field tests.

Discussion of the Tentative Specifications for Ready Mixed Concrete

By Duff A. Abrams[1]

In this discussion reference will be made to three features of the Tentative Specifications for Ready Mixed Concrete (C 94 – 41 T),[2] which was accepted at the 1941 Annual Meeting, namely:

Definition of ready mixed concrete.
Notes and footnotes in A.S.T.M. Standards.
Is the report of the Joint Committee authoritative?

Definition

The specifications include the following definition:

"*Ready Mixed Concrete.*—The term ready mixed concrete is used to describe mixed concrete (either central mixed or transit mixed) delivered in a plastic state to the site of the work ready for use."

The definition of a tangible object should describe it in terms of obvious characteristics or of readily measurable properties. The properties selected should be necessary and sufficient to distinguish it from all other objects of the same class or of different classes. The description should not be couched in words that themselves require definition; above all it should not incorporate the word to be defined. Let us analyze the above definition part by part in order to determine whether it conforms to these minimum requirements.

"*The Term Ready Mixed Concrete.*"—This expression is indeterminate, erroneous, redundant. As written the *term* in reality includes three different terms whose relationships cannot be determined. It is impossible to know where the emphasis is to be placed; whether it is "*ready-mixed* concrete" or "ready *mixed-concrete.*" The expression ready-mixed has appeared in an erroneous form in the A.S.T.M. publications for many years; it is a compound adjective and should be written with a hyphen. The word *term* is superfluous as well as erroneous; ready-mixed concrete is to be defined; it is not necessary to characterize it by calling it a term.

"*Is Used to Describe.*"—The sole purpose of a definition is to describe something; it is not necessary to tell the reader that something is to be described.

"*Mixed Concrete.*"—All concrete is mixed; it is not concrete until it is mixed; hence *mixed* is redundant; it adds nothing to the definition. Much concrete manufactured 50 yr. ago is still mixed.

"*Central Mixed or Transit Mixed.*"—It will be necessary to incorporate definitions of these terms in the definition of ready-mixed concrete before they can contribute to our knowledge of that expression. Both terms are erroneously written; they are compound adjectives, hence should have hyphens.

In the final analysis central-mixed concrete does not differ in any essential form from other concrete; instead of dumping the concrete from the mixer into wheelbarrows and hauling it 10 rods, it is dumped into a truck and hauled 10 miles. In the case of transit-mixed concrete, instead of the mixer being set on a fixed foundation it is mounted on a truck.

"*Delivered in a Plastic State.*"—This injects a new factor into the definition of a tangible object. Whether it is ready-mixed concrete, or not, depends on whether and where it is delivered. An 8-yd. batch of concrete would not be changed if the truck driver should take the wrong turn and drive in the opposite direction from his intended destination. The definition of a material should not be contingent on latitude and longitude. Concrete should have certain characteristics, regardless of where it is delivered.

While "plastic" has been used by many writers to describe newly-mixed concrete, it requires considerable imagination and much wishful-thinking to conceive of newly-mixed concrete of the type delivered in trucks in the City of New York as a plastic material. "Plastic flow" has long been used to describe the deformation of concrete under continuous loads, even after it is several years old; this indicates that the concrete is never too old to be plastic. Plastic may be useful as a popular concept

[1] Consulting Engineer, New York, N. Y.
[2] 1941 Supplement to Book of A.S.T.M. Standards, Part II, p. 321.

of newly-mixed concrete; however, since concrete is always "plastic," the word is of doubtful value in this definition. Why not call the newly-mixed concrete "workable?"

"*To the Site of the Work.*"—In a building 1000 ft. wide and 1600 ft. long, under construction, the entire area is the "site of the work"; concrete delivered, "in a plastic state," to any point would presumably be ready-mixed concrete. We may ask what it was just before the truck turned the last corner as it approached "the site of the work." If the driver delivered the load to the wrong job, would it be ready-mixed concrete?

It is obvious that concrete should be delivered to some point (accessible to a heavily-loaded motor truck) as designated by the purchaser; this need not be a part of the definition any more than are the terms of payment. It is ridiculous for a definition to be worded so that it is ready-mixed concrete if delivered to the southeast corner of a building and something else if delivered to the northwest corner.

Up to this point we have: "The term ready mixed concrete is used to describe mixed concrete (either central mixed or transit mixed) delivered in a plastic state to the site of the work"; 28 words have been used and we have made no progress whatever toward a definition; these words tell us nothing positive of the thing to be defined.

The word *mixed* appears four times in the definition, yet there is no hint to the meanings of this term, hence we must conclude that the entire emphasis has been placed on ready. Let us see what *ready* means.

"*Ready for Use.*"—This is the most amazing and contradictory feature of the definition; it violates two important principles: (1) *Ready* is a part of the term being defined; (2) *ready for use* manages by a peculiar tautology to undo anything that might have been accomplished by the preceding 28 words, and to give a new and puzzling twist to the whole definition. When unqualified *ready* means *ready for use*, however, in spite of the double emphasis on the use feature, concrete of the type which the committee is attempting to define is never ready for use until several days or weeks after it is in place, and then only providing that it has been allowed to cure properly, that is, to set and harden (more or less undisturbed) under a proper moisture-and-temperature environment. What use can be made of newly-mixed concrete? It is difficult to think of any. In general we can only place it in the work in preparation for future use.

The "use" of a reinforced-concrete beam, girder, floor or roof slab is to carry loads; these units may be made of ready-mixed concrete, however, they are not *ready-for-use;* in fact such members cannot carry loads for several days, but must themselves be supported by independent shores, until, in the judgment of the builder, they become ready-for-use.

Conflict.—There is an irreconcilable conflict between the two principal characteristics of concrete which are embodied in the definition, hence we are compelled to resort to deduction in order to determine if possible what the committee wished to say. We must choose between "ready for use" and "in a plastic state." If we choose the first, it is not in-a-plastic-state; if we choose the second, it is not ready-for-use. We may weight these features as shown in the following table:

Item in Definition	Weighted Value	
	Ready-for-Use	In-a-Plastic-State
"Mixed concrete" (All concrete is mixed, hence includes both ready-for-use and in-a-plastic-state)	1/2	1/2
"Central mixed or transit mixed" (Noncommittal, but includes both ready-for-use and in-a-plastic-state)	1/2	1/2
"Delivered in a plastic state to the site of the work" (Not ready-for-use)	0	1
"Ready for use" (This is positive and a "double-header"; it is not in-a-plastic-state)	2	0
Total	3	2

The score stands 3 to 2 in favor of ready-for-use. In a legal contest involving this definition, the court would have no choice but to attempt to evaluate the meaning as we have done.

The only types of concrete that meet the predominating ready-for-use feature of the definition are building blocks, bricks, pipes, joists, slabs, or other precast units; these can be delivered to the work and used to carry loads immediately, or as soon as permitted by other necessary operations.

Summary on Definition.—I cannot find a redeeming feature in this definition; it violates every principle that should characterize a definition. It uses many words to say nothing significant about the expression to be defined; what is said is either unimportant or conflicting. The definition may be boiled down to:

> "Ready-mixed concrete is concrete (mixed) which is ready (for use) for use."

The definition as accepted by the Society is not conclusive—it is not even suggestive of the thing to be described. It not only fails to define ready-mixed concrete, but defines something entirely different from what (apparently) was intended. Due to the conflict cited the definition is impractical and inoperative and should be withdrawn. The term *ready* was a misnomer from the beginning, its use in this sense should be abandoned.

One may speculate as to reasons for omitting any reference to many factors which are necessary and sufficient to distinguish ready-mixed concrete from the usual run of newly-mixed concrete, such as: (*a*) Automatic and permanent records of the quantities that enter into each batch, (*b*) continuous agitation after water is added and (or) after mixing begins, (*c*) maximum mixing or hauling time beyond which the batch would fail to meet requirements due to excessive grinding of aggregates, (*d*) a criterion of the thoroughness of mixing (merely saying four times that concrete is mixed is no guarantee of proper mixing), (*e*) segregation upon discharge.

Notes and Footnotes in A.S.T.M. Standards

The Tentative Specifications for Ready Mixed Concrete bring to the front the question of the status of notes and footnotes in A.S.T.M. standards. In these specifications we find notes and footnotes which vary from a few words to a half a column of small type; and if notes and footnotes were not enough, there is a 46-word footnote to a footnote.

Most of the material in Section 11 in the Standard Specifications for Ready Mixed Concrete (C 94 – 38) reappears in the Tentative Specifications C 94 – 41 T as a

footnote to Section 10. What is the status of these important sections on strength tests, since they have been transposed to a footnote?

A footnote under Section 5 (*c*) and (*d*) devotes about 400 words to a "blurb" for a trade association. This form of free advertising is out of place in an A.S.T.M. standard.

I do not recall having seen a specification which was to form the basis for an actual contract for concrete or concrete work that was encumbered by notes, footnotes, and footnotes to footnotes. These features appear to be unique with the A.S.T.M. This seems to be an opportune time for the Executive Committee or some other authoritative group in the Society to:

(*a*) Set up criteria for the interpretation of footnotes in standards;
(*b*) Rule that such footnotes have no standing; or,
(*c*) Proceed to eliminate notes and footnotes and footnotes to footnotes from A.S.T.M. standards.

The A.S.T.M. standards for concrete should be revamped into workmanlike specifications; they should not consist of a rambling collection of unrelated statements whose import can be established only by expensive litigation.

Is the 1940 Report of the Joint Committee Authoritative?

The Tentative Specifications for Ready Mixed Concrete, referring to "General Specifications for Concrete," tell us in a footnote:

"For authoritative recommendations, reference may be made to the 'Recommended Practice and Standard Specifications for Concrete and Reinforced Concrete,' 1940 Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete. . . . ."

By this device Committee C-9 has officially committed the Society to the thesis that the 1940 Report of the Joint Committee is "authoritative" on "general specifications for concrete." I have shown elsewhere[3] that on such an elemental subject as fine aggregate grading, the report is not authoritative, but on the contrary is so marred by errors and contradictions as to make nonsense of the sections dealing with this subject. My discussions dealt at length with such topics as "total percentages" and "cyclopean particles," and pointed out many other absurdities.

The footnote quoted above asserts something that is not true, hence, in my opinion it should be deleted from the Tentative Specifications for Ready Mixed Concrete.

[3] D. A. Abrams, "Fine Aggregate Grading in the 1940 Report of the Joint Committee on Concrete and Reinforced Concrete," ASTM Bulletin, No. 111, August, 1941, p. 35.
See also discussion of the Report of the Joint Committee, *Proceedings*, Am. Soc. Civil Engrs., June, 1941, p. 1087; and "Fine Aggregate Grading," *Bulletin 425*, Am. Railway Eng. Assn., June-July, 1941.

Testing Laboratories Get Priorities Rating

In a release from the Office of Production Management, dated November 15, the Division of Priorities announced a move to broaden the assistance already extended to research laboratories, through an order assigning a preference rating of A-5 to acquisition of the scarce materials required by manufacturers of the necessary laboratory chemicals and equipment. The order was effective immediately.

Producers who supply laboratories engaged in research, testing, analysis, and in plant control studies, as well as clinical and academic (college and high school) laboratories, are covered by the order. The rating is applicable to material required for packaging the equipment for delivery, as well as to manufacturing elements.

A producer to whom the order has been issued may extend it to a supplier, if necessary, by executing an additional copy in the manner prescribed.

A previous order, P-43, extended to certain accredited laboratories engaged in scientific research a preference rating of A-2, and is applicable to orders placed by them for essential materials. The new order, however, specifically aids producers of equipment which the laboratories require.

Ordnance Materials Inspectors Required

A recent communication from the United States Civil Service Commission, Washington, indicates that so urgent is the need for naval ordnance materials inspectors for employment at contractor plants throughout the country that requirements for admission to the examination announced to fill these positions, particularly for the junior inspector positions, have been modified. Successful completion of an appropriate defense training course will now meet the full requirements for this grade. Persons appointed at this level ($1620 a year) have excellent opportunity for advancement since many vacancies in higher positions are filled from this group.

"Taking a Test Bar from Electric Arc Furnace"
Honorable Mention, Professional, in the Fourth A.S.T.M. Photographic Exhibit, by W. J. Kjeldsen, Western Electric Co.

ASTM Bulletin

DECEMBER 1941

NO. 113

TWO-SIXTY
SOUTH BROAD ST.
PHILADELPHIA, PENNA.

Offers of Meeting Papers by February 1

COMMITTEE E-6 ON Papers and Publications is extending to each member of the Society the customary invitation to offer papers for presentation at the 1942 annual meeting in Atlantic City on subjects relating to the properties and testing of engineering materials.

In order that as many as possible of the technical papers and committee reports can be preprinted in advance of the meeting, it is desirable that the program be developed early. Committee E-6 has fixed February 1 as the limiting date for receipt of offers but members who may be considering the submission of a paper are urged to send their offers to A.S.T.M. Headquarters *as soon as possible*. Suitable blanks which should be used in sending the necessary information with respect to the offer of a paper can be obtained from the Society offices. Each offer must be accompanied by a summary of the proposed paper in such detail that its scope is clear and also to point out features that in the author's opinion make the paper a desirable one for presentation and discussion.

Evaluation of Materials

SEVERAL OTHERWISE unconnected articles in this BULLETIN have as one underlying fundamental in common, the importance of the proper evaluation of materials and a direct correlary is the strategic importance of the materials and testing engineer.

Industry and Government, whether it be Army, Navy, Air branch or a civilian department, must look to their materials technologists as they never have before to solve many materiel problems, in the solution of which conservation of strategic and critical materials by substitution or other method is not only a patriotic move but essential, if the product is to be turned out.

We find in the relatively new Bureau of Industrial Conservation (see page 7) materials technologists are a moving force.

A short note from the U. S. Civil Service Commission indicates the urgency for Naval materials inspectors—men who must determine whether the materials and products meet the specifications and requirements. The need is for more and more trained materials men, and tieing in with this need are two new books by prominent A.S.T.M. members dealing with training of engineers in materials testing and inspection. Each book refers to the readily apparent fact that testing and the careful interpretation of the results are of increasing importance. Careful inspection will be all the more important, in view of the speed-up in production.

Unfortunately the situation—the need for more technical men—will undoubtedly get worse before it gets better for some materials now scarce will become more so and some now *relatively* plentiful will get scarce and the need for technical skill will continue to rise.

We have noted the tremendous loads many of our leading technical men are carrying, but we believe that by careful husbanding of the abilities we have available—with judicious "thin-spreading" here and there—the American testing engineer and materials technologist will demonstrate that come what may—somehow—he can deliver the goods.

Twenty Years with the ASTM BULLETIN

1941 IS THE TWENTIETH year that the ASTM BULLETIN has been issued. Just whether those responsible were conscious that the date selected for the first issue might raise some eyebrows is not known, but it is certain that in selecting April 1, 1921, the staff was not uncertain about the future growth of the new enterprise.

While steady progress was made for the first decade and the editorial portion of the BULLETIN was kept in step with the growth of A.S.T.M. activities, the most notable changes have occurred within the past five or six years when the Committee on Papers and Publications expanded the scope to include technical papers and reports and related articles. The Index to ASTM BULLETINS, published in this issue, will indicate the rather wide coverage of important subjects and problems in the materials field which have been handled in the six issues during the year.

Many comments have been received on the worthwhileness of this publication, and in preparation of material one important thought is always in the mind of the editors, namely, to conserve the reader's time. Two methods are adhered to: First, an attempt to steer clear of verbosity and to be concise; second, to include material which is specifically in the field of engineering materials where A.S.T.M. interests lie.

While it is a far cry from BULLETIN No. 1 with its four pages to an issue today, basically the purpose of publishing the BULLETIN as stated at the outset still holds, namely, to keep the average member in closer touch with happenings in the Society and its committees, and to provide a means of current contact with the members.

With respect to the inclusion of technical papers, there is a growing group of members who feel that the wider dissemination offered by the BULLETIN and more prompt publication than is afforded by the *Proceedings* make of this an attractive medium for the technical writer whose paper is of an informational character rather than of strictly reference nature that would dictate publication in the annual *Proceedings*.

Invitations to submit papers are not limited to A.S.T.M. members, many outstanding technical contributions to our *Proceedings* having been made by men who were not affiliated with the Society.

Editorial Change in Analytical Methods for Cement

Attention is called to an editorial change in the Standard Methods of Chemical Analysis of Portland Cement (C 114 – 40). In the procedure for determining chloroform-soluble organic substances, as described in Section 32, the second sentence should be changed to read as follows by the addition of the italicized words:

> While stirring the slurry to a uniform suspension, add rapidly 185 ml. of HCl (sp. gr. 1.19) *in which 10 g. of* $SnCl_2.2H_2O$ *have been dissolved* and continue the stirring.

This minor change has been suggested by Committee C-1 on Cement as it has been found better to use stannous chloride than to determine sulfur in the organic residue since the former requires little extra time. This change should be noted on page 24 of the 1940 Supplement to Book of A.S.T.M. Standards, Part II, and also in Methods C 114 as published in the compilation of "A.S.T.M. Standards on Cement," September, 1941, page 30.

Emergency Alternate Federal Specifications

Continuing the policy of announcing the latest emergency alternate Federal specifications, there are listed below those emergency alternate Federal specifications received since the October issue of the Bulletin, the specification numbers with a brief description being given.

Under the plan being followed the Federal specification itself is not changed, but where the emergency alternate requirements may be considered suitable alternates for the materials covered by the Federal specifications, they can become effective. Their issuance is primarily in the interest of conserving certain strategic materials.

A.S.T.M. Headquarters is prepared to distribute a limited number of the emergency alternate Federal specifications on request. Advantage has been taken of this offer by several members to obtain copies of those items which concern them especially.

Specification Number	Description
E-RR-C-451a	Cloth; Wire, Screen
E-SS-R-501	Roofing; Asphalt-Prepared, Smooth-Surfaced
E-UU-P-388a	Paper; Mimeograph (supersedes E-UU-P-388a, dated October 3, 1941)
E-FF-H-106	Hardware, Builders'; Locks and Lock-Trim
E-FF-H-111	Hardware, Builders'; Shelf and Miscellaneous
E-FF-H-116b	Hardware, Builders'; Hinges (Nontemplate)
E-FF-H-121a	Hardware, Builders'; Door-Closers
E-RR-T-41a	Tableware; Corrosion-Resisting-Steel (supersedes E-RR-T-41a, dated July 7, 1941)
E-RR-T-51a	Tableware; Silver-Plated (supersedes E-RR-T-51a, dated June 20, 1941)
E-T-R-601a	Rope; Manila
E-QQ-B-671a	Bronze, Aluminum; Castings (supersedes E-QQ-B-671, dated Sept. 12, 1941)

Schedule of A.S.T.M. Meetings

Date	Committee	Place
December 2	D-18 on Soils for Engineering Purposes	Baltimore, Md.
December 4, 5, 6	C-9 on Concrete and Concrete Aggregates	Baltimore, Md.
December 5	C-7 on Lime	Washington, D. C.
December 5	C-12 on Mortars for Unit Masonry	Washington, D. C.
January 12, 13	A-1 on Steel	Philadelphia, Pa.
January 19, 20	Executive Committee	Philadelphia, Pa.
March 2–6	Spring Meeting and Committee Week	Cleveland, Ohio
June 22–26	Forty-fifth Annual Meeting	Atlantic City, N. J.

Vice-President Harvey in OPM

Members of the Society will be interested to know that Vice-President Dean Harvey, Materials Engineer, Engineering Laboratories and Standards Department, Westinghouse Electric and Manufacturing Co., is now serving as consultant on a variety of conservation and specifications problems in the Specifications Branch of the Bureau of Industrial Conservation, his services having been requested several weeks ago by Bureau Director Lessing Rosenwald. He is occupied with problems involving a wide range of materials. He is serving on a part-time basis on loan from his company.

Simplification of Structural Steel Shapes

Intensive work in the Iron and Steel Branch of the Office of Production Management with various interests cooperating including the American Iron and Steel Institute has resulted in a simplified list of structural steel shapes which will become effective as of February 1, 1942. This latest list, dated September 29, 1941, gives data covering wide flange beams and other types, bearing piles, channels, angles, zees and tees, and other miscellaneous sections. The American Iron and Steel Institute has published the list in pamphlet form and copies can be obtained either from the Institute Office, 350 Fifth Ave., New York, N. Y., or from the American Institute of Steel Construction, 101 Park Ave., New York. The District Engineers of the A.I.S.C. are also prepared to furnish copies, the addresses of these men being as follows: E. N. Adams, 192 Chandler St., Worcester, Mass.; M. H. Bell, Masonic Temple Building, New Orleans, La.; L. H. Dodd, 1405 Paul Brown Building, St. Louis, Mo.; B. F. Hastings, 1737 Chestnut St., Philadelphia, Pa.; J. M. Marshall, Jr., Rhodes-Haverty Building, Atlanta, Ga.; Alexander Miller, 2125 N.B.C. Building, Cleveland, Ohio; W. T. Norris, Sharon Building, San Francisco, Calif.; Henry Penn, 53 W. Jackson Boulevard, Chicago, Ill.; and Jack Singleton, 622 New England Building, Topeka, Kan.

Additional Publications Issued

A NUMBER OF TECHNICAL publications and special compilations of standards published in the late summer and early fall were previously described in the October ASTM BULLETIN; since this a number of other publications have become available and notes concerning these follow. Special prospectuses describing three of the publications, namely, the two compilations of Standards on Mineral Aggregates and on Copper and Copper Alloys, and the Symposium on Particle Size Measurement were mailed to the members early in December so that orders can be placed at the members prices.

Standards on Copper and Copper Alloys:

This publication issued for the first time gives in their latest approved form some 73 specifications and tests covering wire, plate, rods, sand castings, and non-ferrous metals as developed by Committees B-5 on Copper and Copper Alloys, Cast and Wrought; B-1 on Copper and Copper-Alloy Wires for Electrical Conductors; and B-2 on Non-Ferrous Metals and Alloys. Because of the intensive activity in these fields this compilation should fill a definite need. 350 pages, heavy paper cover, to members, $1.50; list price, $2.00.

Standards on Mineral Aggregates:

This is another new publication intended to provide in convenient form a large number of A.S.T.M. specifications and tests pertaining to such materials as crushed stone, gravel, slag, and related products used in concrete, road building, roofing construction, and like categories. Thus the book incorporates the results of work on mineral aggregates in the charge of Committees C-9 on Concrete and Concrete Aggregates, D-4 on Road and Paving Materials, and D-8 on Bituminous Waterproofing and Roofing Materials. There are upward of 50 standards. 150 pages, heavy paper cover, to members, $1.00, list price, $1.25.

Standards on Electrical Insulating Materials:

This annual publication sponsored by Committee D-9 provides current specifications and tests covering such materials as insulating varnishes, paints, lacquers; molded insulating materials; ceramic products; electrical tests; mica products, etc. In addition to all of the A.S.T.M. standards in this field, there is the current report of Committee D-9 itemizing all the changes in the standards in its charge, with discussions on significance of tests and other appended material. 350 pages, heavy paper cover, to members, $1.75; list price, $2.25.

Standards on Rubber Products:

The 1941 edition of this compilation, now issued on an annual basis, provides in compact form the some 39 tests and specifications developed by Committee D-11 on Rubber Products, covering hose and belting, gloves, matting, tape, wire and cable, rubber cements, and hard rubber products. The widely used test methods both physical and chemical comprising the first part of this volume are of much value to the technologists and others concerned with the production and use of rubber. The price to members of this 275-page compilation in heavy paper cover is $1.25; list price, $1.75.

Symposium on Particle Size Measurement:

This symposium was a technical feature of the Society's 1941 Spring Meeting, publication having been delayed in order to give the authors an opportunity to incorporate the latest information in their contributions. The seven technical papers cover such topics as the shape and surface of fine powders by the permeability method, surface area of cement, adsorption of pigments, use of sedimentation methods, and a description and discussion on the electron microscope. This 120-page publication is available in cloth or heavy paper cover to members at $1.00 and 75 cents, respectively; list price, $1.50 and $1.25.

Selected A.S.T.M. Standards for Students in Engineering:

While the previous edition of this publication was intended to cover demands through 1942, unprecedented use of the book, particularly in National Defense Training courses, necessitated reprinting, just completed. Essentially the 240-page publication remains unchanged but all standards have been brought up to date and one or two sections of the book have been expanded. This is widely used as a laboratory manual and is furnished to schools and students at 50 cents a copy on orders for ten or more. The price to A.S.T.M. members and others is $1.00.

A.S.T.M. Emergency Alternate Provisions

AS ANNOUNCED IN the August and October BULLETINS a procedure has been set up by which emergency alternate provisions in A.S.T.M. standards can be issued, this special procedure being set forth in detail in the 1941 A.S.T.M. Year Book, page 321. The first of these emergency alternate provisions became effective August 25 in the Standard Specifications for Insulated Wire and Cable: Class AO, 30 Per Cent Hevea Rubber Compound (D 27 – (41). The second is an Emergency Alternate Provision in the Tentative Specifications for Rope-Lay-Stranded and Bunch-Stranded Copper Cables for Electrical Conductors (B 158 – 41 T) which became effective on November 28 after acceptance by the Society by action of Committee E-10 on Standards.

The preamble to each of the emergency alternate provisions to be issued will read as follows:

"These Emergency Alternate Provisions are issued by the American Society for Testing Materials in accordance with a special procedure in the interest of expediting procurement or conserving critical material during the period of National Emergency. They are intended for use where they may be considered by the purchaser of the material as a permissible alternate for the specific application or use desired."

Although these emergency alternate provisions are incorporated as part of the 1941 Supplements to Parts I and

III of the 1939 Book of Standards, they are being published here in accordance with the requirement that all provisions must be published in the next succeeding ASTM BULLETIN.

EA D-27

The following Emergency Alternate Provisions, when specified, may be used as an alternate in A.S.T.M. Standard Specifications for Insulated Wire and Cable: Class AO, 30 per cent Hevea Rubber Compound (D 27 – 41)[1] and affects only the requirements referred to:

Section 25.—To this section, which specifies cable tape made from cotton cloth having a weight of not less than 1 lb. per 4 yd. based on a width of 36 in. and not less than 56 by 60 picks per inch, add the provision that cable tape made from cotton cloth of the following constructions may be used:

	Weight, lb. per sq. yd.	Number of Yards per Pound (40-in. Width)	Thread Count
Alternate (a)...	0.225	4.00	60 by 52
Alternate (b)...	0.210	4.30	56 by 48

EA B-158

The following Emergency Alternative Provision, when specified, may be used as an alternate in A.S.T.M. Tentative Specifications for Rope-Lay-Stranded and Bunch-Stranded Copper Cables for Electrical Conductors (B 158 – 41 T)[2] and affects only the requirements referred to:

Section 5.—Delete the requirements in reference to the length of lay of bunch-stranded conductors in Paragraphs (*d*) and (*e*) and substitute the following provision:

In bunch-stranded conductors classes J, K, L, M, N, O, P, and Q of No. 18 A.w.g. size, a maximnm lay of 1 in. for the wires is permitted.

The emergency alternate provision in the copper cable specifications permits a maximum lay of 1 in. for the No. 18 size only. Previous lay was "not greater than 16 times the outside diameter of the completed member or conductor unless otherwise specified." A No. 18 – 41/34 stranded wire has an outside diameter of 0.049 in. so that the maximum lay now permitted is 0.784 in. This means that the lay is to be increased from a little over 3/4 in. to 1 in. Underwriters' Laboratories requirements are 0.80-in. maximum and are to be changed to accept the proposed stranding. This alternate provision has the backing of the wire manufacturers and the National Electrical Manufacturers Association and is requested as an emergency procedure to relieve the bottleneck in the No. 18 flexible cord production. It is claimed that the large producers can make a worthwhile speed-up in production and, although no estimate is given, it would appear that with fixed speed of strander rotation, which may already be at a maximum, a gain of some 25 per cent could be made in the linear feet produced.

An additional important factor is the statement that orders under Government specification, which now take a large part of production, permit the 1-in. lay and many manufacturers are using it to get maximum production in the shortest time. They do not wish to make new machine setups when running commercial cord which now has to meet different specifications calling for the 0.784-in. lay.

[1] 1941 Supplement to Book of A.S.T.M. Standards, Part III, p. 102.
[2] 1941 Supplement to Book of A.S.T.M. Standards, Part I, p. 369.

Open Forum at Los Angeles Meeting

AT AN OPEN FORUM on "Specifications, Their Importance in the Present Emergency" sponsored by the A.S.T.M. Southern California District Committee on October 28, leading authorities in various materials fields comprised a *panel* which introduced, developed and guided discussion of the subjects.

Among the subjects introduced were "Specifications, Their Purpose and Intent," "Specifications as Related to Inspection," and "Protective Coatings and Their Specifications," pertaining especially to the newer airplane paints. Lively discussion and the asking of numerous questions followed the presentation of each subject. Many interesting ideas and views were aired at this meeting, none of which, however, as announced beforehand, were recorded.

Messrs. John Disario, Columbia Steel Co., who is chairman of the district committee, and Roy E. Paine, Aluminum Co. of America, served as co-chairmen of this Open Forum which attracted more than 150 Society members and guests. It was held at the Los Angeles Elks Club. Some indication of the success of this meeting can be gleaned from a statement made by the Secretary of the District Committee, E. O. Slater, Smith-Emery Co., that the only fault to be found was the shortness of time.

Materials for Water Tanks and Standpipes

IN THE TENTATIVE STANDARD SPECIFICATIONS for Elevated Steel Water Tanks, Standpipes and Reservoirs prepared by the American Water Works Association and the American Welding Society there are numerous references to A.S.T.M. specifications. Section 2, which covers requirements for materials, incorporates a number of A.S.T.M. specifications including those covering Plates (A 7, A 10, A 78, A 89, A 113); Structural Shapes (A 7, A 10); Rivets (A 31, A 141); Pins (A 108); Castings (A 27); and Filler Metal. There are references in other sections to additional A.S.T.M. standards.

These new specifications which were published earlier in the year in the *Journal of the American Water Works Association* are a revision and extension of the existing standard in effect for over ten years, covering riveted construction. The new specifications cover either welded or riveted tanks.

Chicago Group in Local A.S.M.E. Meeting

THROUGH THE Chicago District Committee, A.S.T.M. members participated in the New England Harvest Home and Thanksgiving Dinner sponsored by the Chicago Section of the American Society of Mechanical Engineers held on November 26 at the Chicago Towers Club to honor Sir Herbert Gepp of Australia who spoke on "Australia's War Effort as a Member of the British Commonwealth of Nations." E. R. Young, Metallurgical Engineer, Climax Molybdenum Co., Chairman of the Chicago A.S.T.M. district group, was at the speakers' table with local chairmen of several other participating societies.

Sir Herbert Gepp, who is in this country on a mission for his government, reviewed Australia's history and in particular its geography, topography and natural resources as a background for a statement of their present war activities. Everyone present left the meeting with a very much better knowledge of Australia as a country and continent and with the feeling that the people of Australia are very closely akin in many ways to those in America.

Materials Testing

Gilkey-Murphy-Bergman

A MOST INTERESTING publication has been recently issued entitled "Materials Testing," subtitled Theory, Practice and Significance of Physical Tests on Engineering Materials. The authors, Professors H. J. Gilkey and Glenn Murphy of Iowa State College, and E. O. Bergman, Technical Advisor, C. F. Braun & Co., formerly Associate Professor of Civil Engineering, University of Colorado, are active A.S.T.M. members. The book is significant not only for what it contains but what it represents. However, only from a careful study of the volume can a real appreciation of its contents be realized. There are not many materials technologists who have a keener appreciation of what testing of materials means than Gilkey and his associates, and anyone who has had any contacts with the authors would understand that the book has been carefully prepared.

A few excerpts from the Preface will convey some idea of the purpose of the publication.

"... materials testing can be and should be made one of the most significant and broadening (in a technical sense) of the courses in any engineering curriculum. ...

"The work of the laboratory needs constantly to be tied up with and related to that of the classroom. ...

"The well-rounded course in materials ... should be made the proving ground whereon these formulas and properties lose their sacredness and their mystery and are recognized for what they are—useful, but not infallible, tools of engineering.

"... mere interest and proficiency in manipulative operations must not be accepted as the primary objective or as a criterion of mastery. Major emphasis should always be focused upon an understanding of the purposes of the test and the significance of the data secured. The student should be given an insight into the function and background of purchase specifications and into the need for and methods of inspection and the making and interpretation of acceptance tests. ...

"Although relatively few engineering graduates expect to become testing engineers, most of them must at times plan and specify tests and interpret the results from tests. To that end it is essential that every engineer be familiar with the nature and scope of the A.S.T.M. and related specification-making bodies whose activities are all or largely in the field of materials.

"The testing of materials is constantly assuming a more important role in engineering, which places upon the engineering college increasing opportunities and obligations in this field.... It is important ... that he (the student) be made to realize that in college he is receiving only an introduction to materials testing rather than completing it."

One fundamental problem which the authors had to resolve was whether the book should be sufficiently embracive to meet the needs of different universities and other laboratories with respect to equipment and content of scholastic courses. That they reacted affirmatively seems well founded. The Manual covers a much wider range of subjects than any course in testing materials is (unfortunately) likely to include, but by careful arrangement, correlation, and use of effective tables of contents and an extremely detailed Index, an instructor, department head, or dean can select what he wants to cover.

Chapter topics include the following:

Testing, Testing Equipment, and Testing Observations
Properties of Materials
Flexural Tests
Column Tests
Hardness Tests
Evaluation of Properties from Load-Displacement Data
Tensile Tests
Compressive Tests
Shearing and Torsional Tests
Fatigue and Impact Tests
Design, Control, and Curing of Concrete Mixtures
Experimental Aids in Stress Analysis

Chapter XI is designed to meet a need where the work in materials testing includes all the work offered on plain concrete, and while lengthy in comparison with other chapters it is highly condensed. Each chapter includes a section containing supplementary questions with answers given in Appendix A, which practice seems very commendable. One Appendix gives typical final examinations.

Letter press printed in double column format on an excellent grade of paper and durably bound, the 200-page publication, page size $8^1/_2$ by 11 in., can be obtained from the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y., at $2.75 per copy.

The Analysis and Testing of Roofing Surfacing Materials and Composition Roofing

JUST ISSUED BY R. J. Funkhouser & Co., Inc., Hagerstown, Md., is the second edition of the publication entitled "The Analysis and Testing of Roofing Surfacing Materials and Composition Roofing," prepared by John J. Shank, Director, The Wayne Laboratories. The publication will be of definite interest and service to laboratory directors, technologists, and all those concerned with the technical phases of control of composition roofing and also to companies manufacturing other types of asphalt products.

The compilation is carefully arranged in five parts as follows:

Part I—Roofing Granules, Identification and Classification
Part II—Roofing Granules, Quality and Property Tests
Part III—Testing of Finished Roofing
Part IV—Fine Surfacing Materials and Fillers
Part V—Examination of Oils, Saturants, Asphalts, and Bitumens

Parts IV and V, not included in the first edition of the book, enhance the value of this second edition. The author points out in the preface that many of the test methods are empirical and if concordant results are to be obtained by various investigators, it is necessary that details be observed accurately. However, wherever possible standard procedures of such recognized bodies as the A.S.T.M. have been utilized. In the book are published with the permission of the A.S.T.M. some ten standards as well as information from *Proceedings* on the recovery of asphalt from filled mixtures.

This publication in the form of a substantial loose-leaf binder is well arranged with clear and carefully selected illustrations and a detailed table of contents which includes in order of numeric sequence a list of the illustrations.

R. J. Funkhouser & Co. will send a copy of this book without charge to laboratories and technicians of all companies in the United States and Canada who manufacture composition roofing; also to companies manufacturing other types of asphalt products.

Testing and Inspection of Engineering Materials

Davis, Troxell, and Wiskocil

A PRELIMINARY EDITION for Engineering Defense Training Courses of the extensive publication "Testing and Inspection of Engineering Materials" has been received. Professors H. E. Davis, George E. Troxell, and Clement T. Wiskocil, all of the Civil Engineering Department at the University of California, prepared this book. The publication will be of much value and interest in connection with materials testing and inspection courses.

The authors, who have been very active in the field of testing and research on materials point out that "the industrial and technical world is becoming increasingly test-minded . . . and in view of the important place that the making of tests has now attained in the technical world, it seems appropriate to devote some time, even though brief, to the study of testing as a subject by itself. It is possible through such a study to develop a basis for the preparation of adequate, enforceable specifications and to develop a background for intelligent inspection. Because an increasing number of graduates from the engineering schools are finding their first jobs as inspectors and laboratory assistants, it is felt that emphasis should be placed on teaching directly the fundamentals involved in the performance of valid tests. It is the aim of the authors to provide a general treatment of the problems of testing with specific reference to the mechanical testing of engineering materials and to establish the principles for the inspection of these materials."

After outlining numerous benefits which should be derived in a course from testing, the authors observe that the ends claimed are frequently not fully attained which may in part be due to the brief time allotted to the courses. Some of the difficulty may be that sufficient background information is not readily available.

With this in mind the authors have prepared their text in two sections, one devoted to building up the general concepts of testing, and the other to providing, in such form as to be applicable to most ordinary apparatus, methods of conducting common tests.

In Part I on Principles of Testing and Inspection (260 pages) which includes 138 figures there appear the following chapters:

- The Nature of the Problem
- General Features of Mechanical Testing
- Measurement of Load, Length, and Deformation—Common Testing Apparatus
- Static Tension and Compression Tests
- Static Shear and Bending Tests
- Hardness Tests
- Impact Tests
- Fatigue and Creep Tests of Metals
- Nondestructive Tests
- Analysis and Presentation of Data
- Principles of Inspection

The second part (92 pages) giving Instructions for Laboratory Work covers 21 problems dealing with tests for various materials. The scope of each problem is carefully stated. There are suggested chapters for preparatory reading, special instruments are listed followed by details of procedure, what the reports of tests should cover, and discussion.

Appendix A (50 pages) is a helpful and rather complete Summary of Properties of Common Engineering Materials. For example, there is a six and a half-page coverage of wire rope, an extensive table giving properties of common plastics; likewise information is given for many other materials.

Finally there are included selected references and sources of information. It is of interest to note that 28 general texts are cited covering a number of phases of testing. The other bibliographical material includes, as would be expected, many references to A.S.T.M. papers and reports.

This preliminary edition comprising 390 pages has been printed from typewritten copy by offset lithography with an excellent job being done by those preparing the copy and illustrations, and by the printer. Page size is 7 by 10 in. Copies can be procured from the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y., at $3.50 a copy.

Catalogs and Literature Received

AMERICAN INSTRUMENT Co., 8010–8020 Georgia Ave., Silver Spring, Md. A new catalog of rubber testing instruments, describing instruments and apparatus for making chemical and physical tests of rubber and rubber-like materials, according to A.S.T.M., Federal, and other standards.

THE BRISTOL Co., Waterbury, Conn. Bulletin 554a, a four-page folder describing Bristol's Portable Humidity Recorders. Illustrated.

BURRELL TECHNICAL SUPPLY Co., 1942 Fifth Ave., Pittsburgh, Pa., has issued a comprehensive new 1100-page catalog entitled "Modern Tools of Science." Carrying the catalog designation 341, it covers a wide range of scientific apparatus—chemical, metallurgical, physical, clinical, biological, bacteriological goods. Copyrighted by the Allied Scientific Corp., the publication has several noteworthy features including an unabridged general index of over 90 pages and an extensive 5-page A.S.T.M. Index giving equipment for various A.S.T.M. methods which are listed in numeric order of serial designation. Those responsible have grouped apparatus for various types of analysis together for easy reference and the material as a whole is arranged alphabetically, with index listings on each page.

For convenience a separate A.S.T.M. Index for Petroleum Apparatus is included in the respective section of the book. Helpful tables of information and data are included—international atomic weights, various tables of equivalents, temperature conversion charts, and such information. It is dedicated to "The Man in the Lab" and the several thousand items covered are indeed an indication of his tools and also of the necessary efficient manner in which the apparatus and laboratory supplies industry meets his needs. Members of A.S.T.M. who are interested in the catalog should contact the Burrell Company, writing on their company letterhead.

FISH-SCHURMAN CORP., 250 E. Forty-third St., New York, N. Y. Leaflet No. 287 K describing KPG Precision-Bore Glass Tubes.

FISHER SCIENTIFIC Co., 711 Forbes St., Pittsburgh, Pa. A four-page folder describing the Fisher Electrophotometer, applicable wherever colorimetric analyses are conducted. Illustrated.

C. J. TAGLIABUE MFG. Co., Park and Nostrand Aves., Brooklyn, N. Y. Catalog No. 1210 entitled "TAG Recording Instruments for Temperature and Pressure" describes the new line of recording thermometers and recording pressure gages with 9-, 10-, and 12-in. charts, and gives complete data on mercury, fully-compensated mercury, vapor tension and gas-filled tube systems. 25 pages, illustrated.

TINIUS OLSEN TESTING MACHINE Co., 500 N. Twelfth St., Philadelphia, Pa. Bulletin No. 22, an eight-page folder describing the Olsen Impact Testing Machine with "Change-O-Matic" Head. Features of this interesting new machine include arrangement for Charpy, Izod, and tension impact test without removal or addition of tools or parts. Completely automatic braked. Conforms to A.S.T.M. standard E 23. Illustrated.

NEW MEMBERS TO NOVEMBER 21, 1941

The following 26 members were elected from October 2 to November 21, 1941:

Chicago District

CROWLEY, C. A., President and Director of Laboratory, Technical Service Bureau, Inc., 6805 N. Clark St., Chicago, Ill.

HOLPER, FRANK, Specification Engineer, Russell Electric Co., 340 W. Huron St., Chicago, Ill. [J]*

MEKLER, L. A., Engineer, Universal Oil Products Co., 310 S. Michigan Ave., Chicago, Ill.

Detroit District

NASH-KELVINATOR CORP., PROPELLER DIVISION, Wilson Coats, Chief Metallurgist, 1331 S. Cedar St., Lansing, Mich.

STANDARD PRODUCTS CO., THE, D. R. Stamy, Sales Engineer, 505 Boulevard Building, Detroit, Mich.

New York District

ADVANCE PRESSURE CASTINGS, INC., A. F. Waltz, President, 34–48 N. Fifteenth St., Brooklyn, N. Y.

NATIONAL VARNISHED PRODUCTS CORP., THE, F. M. Damitz, President, Box 67, Rahway, N. J.

GOLDING, M. E., Chief Chemist, Eastern District, Robert W. Hunt Co., 59 Murray St., New York, N. Y.

Northern California District

TODD-CALIFORNIA SHIPBUILDING CORP., CHEMICAL ENGINEERING DIVISION, Harry Davis, General Superintendent, Box 29, San José, Calif.

HARLAN, H. R., Research Director, Harlan Associates, 11 Duboce Ave., San Francisco, Calif.

KEINATH, GEORGE, Consulting Engineer, 36 Knollwood Drive, Larchmont, N. Y.

Philadelphia District

BINTER, F. C., Chemist, E. F. Houghton Co., Philadelphia, Pa. For mail: 126 S. Poplar Ave., Maple Shade, N. J. [J]

CARTER, E. P., Consultant, and Treasurer, Poinsettia, Inc., Pitman, N. J. For mail: 112 Cedar Ave., Pitman, N. J.

JAMIESON, A. L., Assistant Metallurgist, Frankford Arsenal, Philadelphia, Pa. For mail: 833 Middlesex St., Gloucester, N. J. [J]

SAVAGE, FREDERICK, Chie Draftsman, Howe, Stonor v, Kahn, Architects, Phila l-phia, Pa. For mail: 1126 Kenwyn St., Philadelphia, Pa.

Southern California District

KRIVOBOK, V. N., Director of Structural Research, Lockheed Aircraft Corp., Burbank, Calif.

U. S. and Possessions

Other than A.S.T.M. Districts

PHILADELPHIA QUARTZ CO., R. L. Kreyling, Representative, Box 505, Parkersburg, W. Va.

STANLEY CHEMICAL CO., THE, E. M. Hayden, Vice-President and Technical Director, East Berlin, Conn.

CHRISTENSEN, P. M., Chief Engineer, Electrical Division, Colt's Patent Fire Arms Manufacturing Co., 1490 Park St., Hartford, Conn.

ELPHINSTONE, L. M., President, D. C. Elphinstone, Inc., 115 S. Calvert St., Baltimore, Md.

JEFFERIES, W. M., Manager, Buffalo Branch, Pittsburgh Testing Laboratory, 51 Allen St., Buffalo, N. Y.

LORIG, C. H., Metallurgist, Battelle Memorial Inst., 505 King Ave., Columbus, Ohio.

RUSSE, C. F., Manager, Birmingham Branch, Pittsburgh Testing Laboratory, 921 Fifth Ave., North, Birmingham, Ala.

*[J]—denotes Junior Member.

Other than U.S. and Its Possessions

INSTITUTO DEL CEMENTO PORTLAND ARGENTINO, San Martin 1137, Buenos Aires, Argentina.

REESON, W. B., Fabrica de Rayon Viscosa, Ltda., Apartado 763, Barranquilla, Colombia.

THOMAS, R. E., Chief Inspecting Engineer, Egyptian Government, 41 Tothill St., Westminster, London, S. W. 1, England.

Calendar of Society Meetings

(Arranged in Chronological Order)

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS—Fall Meeting, December 1–3, Stevens Hotel, Chicago, Ill.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Annual Meeting, December 1–5, Hotel Astor, New York, N. Y.

EXPOSITION OF CHEMICAL INDUSTRIES—Eighth Annual Meeting, December 1–6, Grand Central Palace, New York, N. Y.

HIGHWAY RESEARCH BOARD, NATIONAL RESEARCH COUNCIL—Twenty-first Annual Meeting, December 2–5, Johns Hopkins University, Baltimore, Md.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS—Annual Meeting, December 3–6, St. Louis, Mo.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE—Winter Meeting, December 29–January 3, 1942, Hotels Adolphus and Baker, Dallas, Tex.

SOCIETY OF AUTOMOTIVE ENGINEERS—Annual Meeting and Engineering Display, January 12–16, Book-Cadillac Hotel, Detroit, Mich.

AMERICAN SOCIETY OF CIVIL ENGINEERS—Annual Meeting, January 21–23, Hotel Waldorf-Astoria, New York, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Winter Convention, January 26–30, Engineering Societies Building, New York, N. Y.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—Forty-eighth Annual Meeting and Seventh International Heating and Ventilating Exposition, January 26–30, Bellevue-Stratford Hotel, Philadelphia, Pa.

INSTITUTE OF AERONAUTICAL SCIENCES—Tenth Annual Meeting, January 28–30, Waldorf-Astoria Hotel and Columbia University, New York, N. Y.

NATIONAL SAND AND GRAVEL ASSOCIATION AND NATIONAL READY MIXED CONCRETE ASSOCIATION—January 28–30, Netherland Plaza Hotel, Cincinnati, Ohio

NATIONAL CRUSHED STONE ASSOCIATION—Annual Convention, February 2–5, Netherland Plaza Hotel, Cincinnati, Ohio.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Mid-Winter Meeting, February 16–20, Chicago, Ill.

AMERICAN CONCRETE INSTITUTE—Thirty-eighth Annual Meeting, February 17–19, Chicago, Ill.

American Society for Testing Materials—Committee Week and Spring Meeting, March 2–6, Hotel Cleveland, Cleveland, Ohio; Forty-fifth Annual Meeting, June 22–26, Chalfonte Haddon Hall, Atlantic City, N. J.

AMERICAN RAILWAY ENGINEERING ASSOCIATION—Annual Convention, March 17–19, Palmer House, Chicago, Ill.

Recent Advances in Nonmetal Chemistry

A SYMPOSIUM ON Recent Advances in the Chemistry of Nonmetals is to be held in Columbus, Ohio, on December 29, 30 and 31, 1941, by the Division of Physical and Inorganic Chemistry of the American Chemical Society. Topics to be discussed will cover such fields as sulfur dioxide, sulfannic acid, selenium and tellurium, phosphates, nitriding of steel, silicon, boron, fluorides, perchlorates, etc. Further details can be obtained from W. C. Fernelius, Ohio State University, Columbus, Ohio.

PERSONALS . . . News items concerning the activities of our members will be welcomed for inclusion in this column.

C. B. Thompson, formerly Rodman, Department of Roads and Irrigation, State of Nebraska, Lincoln, Nebr., is now associate Inspector of Ordnance Materiel, St. Louis Ordnance Plant, St. Louis, Mo.

J. B. Dickson is Assistant Technical Director, American Brakeblok Division, The American Brake Shoe and Foundry Co., Detroit, Mich. He was Director of Research, A. G. Spalding and Bros., Chicopee, Mass.

At the annual meeting of the American Welding Society held in October in Philadelphia, the following A.S.T.M. members received awards and medals: David Arnott, Chief Surveyor of the American Bureau of Shipping, the Miller Medal for conspicuous contributions to the art and science of welding during 23 years; R. H. Aborn, Research Laboratory, United States Steel Corp., the Lincoln Gold Medal for the paper which contributed most to the past year's development of welding; and W. B. Kouwenhoven, Professor of Electrical Engineering and Dean, School of Engineering, Johns Hopkins University, fifth prize of $25 of the Resistance Welders Manufacturers' Association for a paper contributing to progress in resistance welding.

Joseph Emery, Jr., formerly Sampler, Physical Laboratory, Lawrence Portland Cement Co., Thomaston, Me., is now Private, Company A, T 334, Third Medical Training Branch, Camp Lee, Va.

H. J. Baker has discontinued private practice as Inspecting Engineer for the duration of the National Emergency and has accepted appointment as Supervising Engineer on construction of the Nassau, Long Island plant, Sperry Gyroscope Co., Inc.

At a joint meeting of the American Section of the Society of Chemical Industry, the New York Section of the American Chemical Society, and the New York Section of the American Institute of Chemical Engineers held at The Chemists' Club, New York, in November, E. K. Bolton, Chemical Director, E. I. du Pont de Nemours & Co., Wilmington, Del., received the Chemical Industry Medal for 1941, awarded for valuable application of chemical research to industry. L. T. Work, Director of Research and Development, Metal and Thermit Corp., Carteret, N. J., presided at the meeting.

C. H. Carmichael, formerly Plant Manager, Grays Ferry Brick Co., Philadelphia, Pa., is now Assistant Superintendent of Works, Bermuda Base Contractors, Bermuda, this latter position to be effective for a year or more.

W. W. Havens, who was Supervising Engineer, Works Progress Administration, New York, N. Y., is now Engineer, Production Department, Combustion Engineering Co., Inc., New York, N. Y.

At the recent annual meeting of the Association of Consulting Chemists and Chemical Engineers held at The Chemists' Club, New York, the following A.S.T.M. members were elected to office: H. P. Trevithick, Chief Chemist, New York Produce Exchange, Vice-President; W. C. Bowden, Director of Laboratory, Ledoux and Co., Inc., Secretary. C. V. Bacon, Chemical Engineer and Bulk Oil Surveyor and C. A. Crowley, President and Director of Laboratory, Technical Service Bureau, Inc., are continuing in office as members of the Board of Directors.

J. L. Savage, Chief Designing Engineer, U. S. Bureau of Reclamation, Denver, Colo., left his office in September for a temporary assignment as consultant on the Upper Yarra Dam to be built by the city of Melbourne, Australia. On July 15 President Roosevelt signed an amendment to an act which permits Mr. Savage to act as consultant to Australia and advise the government of Punjab, India, in addition to his regular reclamation work.

P. V. Brown, formerly Assistant Subway Engineer, City of Chicago, Department of Subways and Traction, is now with the Jamaica Base Contractors, Inc., Kingston, Jamaica, B.W.I.

G. K. Lake, who was with the Pepperell Manufacturing Co., New York, N. Y., is now in the Navy Department, Bureau of Ordnance, Washington, D. C.

C. H. Mathewson, Professor of Metallurgy, Hammond Laboratory, Sheffield Scientific School, Yale University, was honored on his sixtieth birthday by the 115 members of the Yale Metallurgical Alumni. At a dinner he was presented with a commemoratory volume of 215 pages containing 19 technical papers on physical metallurgy, written for the occasion by his former students.

G. M. Rapp, formerly Chief Engineer, Pittsburgh Corning Corp., Pittsburgh, Pa., is now Research Engineer, The John B. Pierce Foundation, New York, N. Y., with mailing address in Pittsburgh, Pa.

C. E. Bales, Vice-President, Ironton Fire Brick Co., Ironton, Ohio, has been reelected president of the Ohio Ceramic Industries Association.

C. L. Warwick, Secretary-Treasurer of the Society, has been appointed Chief, Specifications Section, Bureau of Industrial Conservation, OPM, and is devoting several days each week to this important work.

NECROLOGY

We announce with regret the death of the following members:

Geoff. A. Saeger, General Supervising Chemist, Ideal Cement Co., La Porte, Colo. Member since 1922. At the time of his death Mr. Saeger did not hold membership on any committee, but until 1938 he was a member of Committee C-1 on Cement and had served on several of its subcommittees.

Walter M. Dunagan, Associate Professor of Theoretical and Applied Mechanics, Iowa State College, Ames, Iowa. Member since 1929. An active member of C-9 on Concrete and Concrete Aggregates for over ten years, Professor Dunagan served as chairman of Subcommittee VIII on Permeability Tests of Concrete, was a member of Subcommittee XI on Evaluation of Data, and was a former chairman of the subcommittee concerned with elasticity and volume changes. He contributed various technical papers to the Society's *Proceedings*. He was extremely active in the work of a number of other organizations, in particular the American Concrete Institute and was associated with a number of scholastic and fraternal societies. Professor Dunagan died as a result of an emergency operation for a stomach ailment. He was 47 years of age and had been at Iowa State since 1924. He is survived by Mrs. Dunagan and two daughters, one a college sophomore, the other a junior in high school.

INDEX TO ADVERTISERS

ASTM Bulletins—1941

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Papers and Reports

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